An exploration of the association between khat chewing and health outcomes in UK-resident male Yemeni khat chewers

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An Exploration of the Association between Khat Chewing and Health Outcomes in UK-resident Male Yemeni Khat Chewers

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A thesis submitted to the University of London for the degree of Doctor of Philosophy

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June 2010

Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university. To the best of the candidate's knowledge and belief, the thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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Abstract

Aims: 1) To identify the characteristics of a sample of Yemeni Khat chewers in Sheffield. 2) To investigate how these characteristics are associated with: a) Self-rated 'compromised' health. b) Self-reported oral health problems. c) Self-reported health conditions and d) Self-reported 'high' nicotine dependence. **Methods:** This cross sectional study recruited a purposive sample of male khat chewers aged 18 years and above, selected during random visits to khat sellers. Data were collected through face to face structured interviews and validated using saliva and expired carbon monoxide samples. Data collected were analysed using simple descriptive, univariate and hierarchical logistic regression analyses. **Results:** Two hundred and four khat-chewing volunteers with a mean age of 44.84 years were interviewed. Sixty five percent were unemployed and 66% had a low level of completed education. Sixty five percent were tobacco smokers. Being older (OR=4.47, 95%CI=1.46-13.66), unemployed (OR=5.49, 95%CI=1.89-15.96), living in uncrowded housing (OR=2.65, 95%CI=1.13-6.22) and reporting low social participation (OR=2.61, 95%CI=1.22-5.61) were found to be statistically significantly associated with self-rated 'compromised' health. A low level of completed education was found to be statistically significantly associated with self-reported oral problems (OR=2.27, 95%CI=1.02-5.04). Self-reported health conditions were found to be statistically significantly associated with being older (OR=3.10, 95%CI=1.32-7.28), unemployed (OR=4.25, 95%CI=1.57-11.47) and living in uncrowded housing (OR=2.96, 95%CI=1.38-6.37). Finally, self-reported 'high' nicotine dependence was found to be statistically significantly associated with starting smoking in the UK or elsewhere as opposed to Yemen (OR=3.18, 95%CI=1.03-9.77), being divorced, single or widowed (OR=3.29, 95%CI=1.11-9.74) and reporting low social participation

(OR=3.69, 95%CI=1.18-11.51). **Conclusions:** A range of demographic and socio-cultural factors were identified that correlated with health impacts, reflecting social inequalities amongst this sample of khat chewers.

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Acknowledgments

First and foremost I would like to say thank you to Allah, the most High whose guidance, help and grace was instrumental in making this work a reality. 'To the best of my power; and my success (in my task) can only come from ALLAH. In Him I trust and unto Him I turn' (Surah: 11. Chap: 12. V: 88).

My deepest gratitude go to Professor Ray Croucher, who stood by me through this entire journey, introduced me to the social determinants of health and taught me not to demonise others behaviour but rather to have a deep holistic insight to its drivers; his scholarly approach was invaluable. Thank you Professor Ray Croucher for seeing the importance of my thesis on this topic and making it happen. Many thanks go to Dr. Sharif Islam who offered me the support and guidance for data analysis. In addition, my thanks go to other colleagues in the Centre of Clinical and Diagnostic Oral Sciences, namely, Miss. Bridgette Job, Dipul Ghosh, Dr. Oluwatunmise Awojobi and Shamsia Begum.

I would also like to express my sincere appreciation to the members and heads of the Yemeni community in Sheffield and Birmingham and everyone who helped in the achievement of this research during the pilot and main study. Iam most grateful to Mr. Abdo Ali Al-Naqib, Miss. Anisa Shaffal, Mr. Abdulla Al-Shaibi, Mr. Mohamed Al-Debis, Dr. Ahmed Mabgar, Mr. Salah Qahatan, Mr. Hilmi Mukrkar, Mr. Mohammed Sultan, Mr. Mohammed Yahia, Mr. Gamom, Mr. Salah Al-Issai, Mr Al-Gabri, Mr. Fathi Galab, Mr. Rajih Al-Muflhi and Miss. Afrah Al-Muflhi.

Many thanks go to Professor Michael Gossop at King's College University-London, Dr. Paul Griffiths head of EMCDDA, Dr. Wael Sabaha in University College of London, Professor Kamaldeep Bhui in Queen Mary University of London and Professor Mustafa al'Absi in University of Minnesota School of Medicine, for their invaluable input. Special thanks go to the ambassador of the United Arab of Emirates in the UK Sheikh Issa Al-kark, the Saudi princess Fadwa Bint Khalid in the UK and Dr. Elham Danish, for their generous contributions towards my tuition fees.

My colleagues, Dr. Sadiqua Mohamed, Dr. Mohamed Haque, Dr. Amal Ali, Dr. Amal Sindi, Dr. Foroogh Khadre, Dr. Sharea Ijaz, Dr. Sucharita Nanjappa, Dr. Budi Sabri and Dr. Samira Osailan for making it a wonderful experience. Also, I would like to express my gratitude to my Aunty Nabiha Shawalla for all her support during my challenging times. Her support was immense and memorable. To my friend Oras Hanbala, who was always there to lend a hand during the journey. Her endless support and assistance, is priceless.

I pay homage to my mother Khadija Thabit Al-Kadassi, father Abdullah Nagi Kassim Ad-Dhalee and my family for their unceasing encouragement and support throughout my entire course of study. My immense gratitude goes to my wonderful husband Dr. Mohammed Salam Al-Maqtari, my husband's family and the precious jewel in my life my daughter Maryam for their support, patience, kindness and strength in times of need. Lastly, and most important of all, I would like to dedicate this work to the souls of my grandparents Thabit Abdul-Malik Al-Kadassi and Sharifa Abdul-Ghani for being my role models.

Chapter 1. Background

The Advisory Council on the Misuse of drugs in the UK (ACMD, 2005) concluded that the evidence of any health impact of khat chewing was insufficient to propose the control of khat chewing amongst minorities, including Yemenis. This decision was the driver for this study. This chapter presents some background about the Yemeni community in the UK alongside a brief description of khat, the social background of khat chewing and the current legal position of khat chewing behaviour worldwide. This current controversy around this behaviour in relation to unfavourable health outcomes is situated within the context of public health criteria.

1.1 The Yemeni community in the UK

The history of the Yemeni community in Britain can be traced back to 1885. British Yemenis originate from "northern" areas such as Shamir district of Taiz, “southern" regions of the Yemen including Ad-Dhale, Aden and other Yemen regions (Sheffield City Council , 2006) (Appendix 11). The Yemeni community in Britain is one of the most established and yet least known of all migrant groupings. Yemenis began settling in British ports at the beginning of the 20th century and after World War II they became part of the immigrant labour force in Britain's industrial cities. The Yemenis were the first community from an Islamic country to settle in Britain (Halliday, 1992). This community was part of the sailor workers on British Merchant navy ships. Gradually Yemeni men moved to work in factories and foundries. In the early 1970s, the decline of UK industry meant that some migrated to the USA and Gulf States. Some Yemenis are still engaged in the steel industry

and other members of the community have set up their own businesses, which include corner shops (Al-Masyabi, 2000). After the civil war in Yemen in 1994 that followed the emergence of both north and south of Yemen, the UK population grew rapidly with the arrival of Yemeni refugees seeking to join friends and relatives in an established community of support in the UK (Soutar, 2007).

1.2 Khat and social background of khat chewing

The Yemeni community, like any other community, has its own drugs. Khat (Appendix 1A) is a green leaf, cultivated and chewed in east Africa horn and peninsula area. This habit is socio-culturally rooted in Yemen (Drake, 1988; Kennedy, 1987). Khat chewing is reported as multifunctional. First, it is used for social interaction in a session that provides an arena for communication and exchanges of ideas and information. Khat sessions within their original context as in Yemen have their own rules and social ethics including time of use, duration of the session, style of use, age group, quantity of use and self-discipline within the session members (Elmi, 1983b; Weir, 1985; Kennedy, 1987). During a khat session, water, coca cola drinks, Arabic coffee, light tea and tobacco (water pipe or cigarettes) are provided (Appendix 1B, 1C). In khat sessions the leaves and bark of the plant are ‘chewed’ slowly over several hours and then tucked inside the cheek, which is known as ‘Takzeen’, to allow for their juices to be absorbed through the buccal membrane. The residues of khat amongst Yemeni chewers are not swallowed but spitted out (Al-Habori, 2005; Hughes, 1973) (Appendix 1D).

Second, students and workers like long distance drivers (Zein, 1988) chew khat to get the stimulant effect that improves performance, keeping them alert and increasing work capacity (Halbach, 1972; Kalix and Braenden, 1985; Toennes et al., 2003; Al-Habori, 2005). Finally, previous informal reports suggest that khat

chewing is used as a remedy for treating asthma, depression and abating hunger and fatigue (Luqman and Danowski, 1976; Al-Motarreb et al., 2002b; Kalix and Braenden, 1985; Dhaifalah and Santavy, 2004). The current literature suggests that Somalis in the homeland and the diaspora use khat chewing as self-medication and a coping mechanism. In addition, it is proposed to be used for treatment of airway diseases (Odenwald et al., 2009; Nabuzoka and Badhadhe, 2000; Rousseau et al., 1998; Freund-Michel et al., 2008).

In khat producing countries like Yemen, Kenya and Ethiopia khat chewing was only confined to a certain social group (Weir, 1985; Beckerleg, 2006; Gebissa, 2008). Recently, khat chewing has become more widely used by different social groups. In the original countries of khat such as Ethiopia and Yemen, multiple factors have contributed to the wide spreading of khat chewing. These include an absence of policies to cropping and to curb khat cultivation (Taye and Aune, 2003). Besides, in Yemen, liberation that allowed social mobility, the flow of money from emigrants, the development of road network and the tolerance of Yemeni religious leaders (Imams) for khat chewing facilitated the wide spread of khat chewing (Kalix, 1987). Additionally, the ability of khat to grow in a wide agro-ecological zone with low cost of production has led to the availability of markets for khat disposal throughout the year. This as well created the availability of a wide range of khat with difference prices which satisfy the needs of different social segments (Muharam et al., 2002).

The literature nowadays reports khat chewing among women from different backgrounds in the khat-origin countries (Kalil, 2002; World Bank, 2007; Patel et al., 2005; Griffiths, 1998). Until recently social stigma could be attached to women

chewing khat in Somalia (Elmi, 1983b) and only old women and women from rich families were reported to chew khat in Yemen (Kalil, 2002).

Likewise, improvement in the air travel network contributed to khat chewing spanning the world, and availability in places like UK, where the communities originally from the horn of Africa and peninsula like Somali, Ethiopian and Yemeni, have settled (Goldenberg et al., 2004; Kalix and Braenden, 1985; Stevenson et al., 1996). In the diasporas, unemployment among men and liberation of women have been suggested as reasons for spread of khat chewing (Nabuzoka and Badhadhe, 2000; Griffiths, 1998).

The pattern of khat sale, its settings, timing and chewing is reported recently to have changed both in the original countries of khat and diasporas. In the UK khat is sold from car boots and chewed in places created called 'mafrash'. In Somalia, khat chewing was observed in the morning and in café shops. Elsewhere khat is processed as 'Hagiggat' capsules (ACMD, 2005; Patel et al., 2005; Odenwald et al., 2005; Bentur et al., 2008).

The legal position of khat chewing varies throughout the world. In France, Switzerland, United Arab Emirates and Saudi Arabie khat chewing is illegal, whereas in the Netherlands and most African countries it is legal (WHO, 2006).

1.3 Khat chewing and public health

Khat chewing has become recently a topic for public health concern nationally and internationally (ACMD, 2005; WHO, 2003; 2006; ESF, 2009).

A disease (condition) to be considered as a public health has to meet the following widely accepted criteria of public health proposed by Sheiham (1996):

First, the condition has to be widespread or severe. The range of khat chewing prevalence estimate has been reported between 4.3-84% (Mwenesi, 1996; Bhui et al., 2003; Elmi, 1983b) nationally and internationally. The highest prevalence is reported from the original countries of khat. Bhui et al (2003) established that the prevalence of khat chewing amongst UK-residents Somalis was around 24%.

Second, the impact and the cost on individual or community are reported as great and the cause of the problems is known. The literature has suggested the adverse effects of frequent khat chewing on aspects of health and socioeconomic of khat chewers (Ali et al., 2004; Ali, 2007; Ali et al., 2006; Al-Motarreb et al., 2005; Kassim and Croucher, 2006; Aden et al., 2006).

Khat dependence as a concept has been recently proposed by Griffiths (1998) and Kassim and Croucher (2006). The latter authors reported that frequent khat chewing was associated with khat dependence and a link between nicotine and khat dependence. However, the complex causal pathways of the social determinants (Newton and Bower, 2005), of khat dependence that influences frequent khat chewing, which may have its impacts on health outcomes and likewise nicotine dependence, is absent in the literature particularly amongst UK-resident Yemeni khat chewers. Therefore, these social determinants should be incorporated in the studies of khat chewing to expand our knowledge beyond the behavioral mechanism of chewers.

Third, the resources, knowledge and methods can be made available to investigate the problem. Establishing determinants of health impacts amongst chewers could be investigated through proper study design and conduct.

Finally, alleviation or prevention of the problem is known, simple and feasible.

Having established the determinants of health impacts of khat chewing in the diasporas like UK, the problems attributed to khat chewing could be approached through adapting WHO (2007) guidelines. The feasibility of this approach has been examined in similar situations such as tobacco use control.

In summary, in the light of the criteria proposed, the role of khat chewing as a behaviour requiring a public health solution in the diasporas communities of the Yemen awaits identification.

1.4 Aims of this study

To identify the characteristics of a sample of Yemeni Khat chewers in Sheffield and to investigate how these characteristics are associated with health outcomes, namely self-rated 'compromised' health, self-reported oral health problems, self-reported health conditions and self-reported 'high' nicotine dependence.

1.5 The structure of the thesis

The next chapter reviews the relevant literature to this study guided by the criteria of public health. Chapter Three describes the research design and methods used to address study aims and objectives. The Results Chapter follows. This chapter comprises two main sections. The first section describes the characteristics and the consumption of both khat and tobacco of a sample of khat chewers in Sheffield. The next section focuses on examining the relationships of these sample characteristics alongside khat chewing and tobacco smoking behaviours with health outcomes. Finally, Chapter Five discusses the findings of the research and draws conclusions.

Chapter 2. Literature Review

2.1 Introduction

This current literature reports first the prevalence of khat chewing. Impacts of khat chewing and gaps in the knowledge follow. The proposed theoretical framework for this current study is justified. Aims, objectives and hypotheses of the study are described.

2.2 Prevalence of khat chewing

Prevalence is defined as 'the proportion of the population that has a disease at a specific point in time' (Rothman and Greenland, 1998). Methods used to search for studies reporting khat prevalence, to extract and assess data of the studies are presented in Chapter 3, Section 3.4.

A descriptive overview of khat chewing prevalence studies locations (in diasporas and khat producing country), time frames and pattern of khat chewing alongside the quality assessment of these studies is reported in this Chaper under Section 2.2.1, 2.2.2, 2.2.3, 2.2.4 and 2.2.5. The demographic and socio-economic distribution of the prevalence of khat chewing in khat producing countries and among khat chewers living in the diasporas (living abroad) will follow.

2.2.1 Prevalence in the diasporas

Eight community studies of all age groups for the prevalence of khat chewing were reported in the diasporas (Table 2.1). Of these, seven studies were in the UK. Five of them were peer reviewed and the other two were grey literature retrieved from the public domain.

2.2.1.1 Prevalence in the UK

The peer reviewed papers reported the range of prevalence between 24% and 67% (Bhui et al., 2003; Bhui et al., 2006; Ahmed and Salib, 1998; Nabuzoka and Badhadhe, 2000; Griffiths et al., 1997). Bhui et al (2003), among a random sample of 180 male and female Somalis in the London Borough of Greenwich, calculated khat chewing as 24%. Bhui et al (2006) in assessing mental disorders amongst 143 Somali males and females in Tower Hamlets Borough reported the prevalence of khat chewing as 28%. Ahmed et al (1998) among fifty two Somalis male in Liverpool recruited through community networks reported the prevalence of khat chewing as 52%. Nabuzoka and Badhadhe (2000) among Somali community members recruited through networking in Sheffield, found the prevalence of khat chewing as 61%. Finally, Griffiths et al (1997) in a study among the Somali community in London reported that the prevalence of khat chewing as 67% of a sample of 207 males and females. The grey literature reported the prevalence of khat chewing amongst the expatriate khat chewers in the UK as between 34%-39%. Patel et al (2005) reported the prevalence of khat chewing as 34% among 602 Somali community members in four cities (Liverpool, Bristol, Sheffield, London) of the UK. Wood (2005), in a community based study among 220 Somali in Sheffield, reported the prevalence of khat chewing among both sexes as 39%.

2.2.1.2 Prevalence in other diasporas countries

Studies of the prevalence of khat chewing in other countries are scarce. Litman et al (1986) in a study in two villages in Jerusalem populated with Jewish Yemeni emigrants reported the prevalence of khat chewing as 39% among 136 respondents.

Table 2.1: Prevalence estimates of khat chewing in the diasporas

Author, year and country of study	Sampling frame	Number of male	Number of female	Sample Size	Time frame	Data collection	Age	Prevalence		
								Overall %	Male%	Female%
Griffiths et al (1997),UK	Somali community members, East London	152	55	207	Week before interview	Face to face interview	18-78 yrs	67	----------	----------
Ahmed and Salib (1998),Uk	Somali community, Liverpool	52	----------	52	Current	Face to face interview	16-70 yrs	52	----------	----------
Bhui et al (2003), UK	Somali community Greenwich, South London-Uk	91	89	180	----------	Face to face interview	20-88 yrs	24	----------	----------
Bhui et al (2006), UK	Somali community in Tower and Hamlets Borough	71	72	143	----------	Face to face interview	18^{+} yrs	28	----------	----------
Wood (2005), Uk	Somali community of Sheffield	130	90	220	Current	Face to face interview	18^{+} yrs	39	64	6
Patel et al (2005),Uk	Somalis in four cities -UK	324	278	602	Month before interview	Face to face interview	17-74 yrs	34	51	14
Nabuzoke and Badhadhe (2000), UK	Somali community in Sheffield	----------	----------	94	Current	Face to face interview	11-26 yrs	61	----------	----------
Litman et al (1986), Jerusalem	Jewish Yemeni emigrants in two villages in Jerusalem	----------	----------	136	----------	Face to face interview	15-65 yrs	39	----------	----------

2.2.2 Prevalence in countries producing khat

The prevalence of khat chewing is varied in countries producing khat such as Yemen and Ethiopia. Thirty six studies were identified which included the following three different study samples:

1. Community and national samples: included eight local community studies of all age groups and five (Selassie and Gebre, 1996; Mwenesi, 1996; Khawaja et al., 2008; World Bank, 2007; Odenwald et al., 2007a) were national studies (Table 2.2).
2. Clinical samples: included five studies with all age groups (Table 2.3).
3. Homogenous samples: eighteen studies used younger age groups such as university and school students (Table 2.4).

2.2.2.1 Prevalence in national and community population

Table 2.2 shows the prevalence of khat chewing in national and community populations. The recent national study carried out by the World Bank (2007), showed that the prevalence of khat chewing in the seven Governments of Yemen among 4027 Yemeni, age group 12 years and above, was 54.6%. Khawaj et al (2008) in a random national survey that recruited 11435 female age 15-49 years from the Data of Yemen Demographic and Maternal and Health Survey (YDMHS) reported the prevalence of khat chewing as 40.7%. The national survey prevalence for Kenya, Ethiopia and Somalia were 4.1%, 30.5% and 36.4% respectively (Mwenesi, 1996; Selassie and Gebre, 1996; Odenwald et al., 2007a).

As for the community studies, Belew et al (2000), in a nine months community based study, that adopted house to house survey recruitment in Ethiopia South Addis Abba rural and urban district, among a random sample of 1200, reported the

weighted current prevalence of khat chewing as 31.7% (18.5% for urban and 37.9% for rural respectively). Alem et al (1999) in a house to house study in a rural area of Ethiopia Butajira, populated with Muslim, found that the prevalence of current khat chewing was 50%. However, khat chewing prevalence in the town of Ethiopia, Jimma, was reported as 31.6% (Ayana et al., 2002). The figures for khat chewing for the whole population of the capital Addis Ababa in Ethiopia were reported recently as 8.7% (Tesfye et al., 2008).

In Somalia, the figures for the population of Hargesia were 10% (Odenwald et al., 2005) whereas the khat chewing prevalence was reported among inhabitants of Hargesia and South Somalia (Mogadishu) as 59% (Elmi, 1983b). Nouman (2004), in one year survey, in three urban and three rural areas in Yemen among 800 households reported the prevalence of khat chewing as 67.9%.

Finally, the figures for khat chewing prevalence in Ijara district North east Kenya, which is populated with Somali inhabitants, was reported as 88% (Aden et al., 2006).

2.2.2.2 Prevalence among clinical samples of all age groups

The range of khat prevalence among clinical studies in Yemen was reported between 29%-95% (Table 2.3). In a study carried out in four different establishments in Yemen for assessing the periodontal status of Yemenis, a prevalence of khat chewing was estimated as 35.8% (Mengel et al., 1996). Hill and Gibson (1987), reported khat chewing prevalence of 95% among 121 Dental Clinic attenders in a village in Yemen. However, Ali et al (2004) in a recent survey among 2500 Dental School attenders in the capital of Yemen (Sana'a), the prevalence of khat chewing was reported as 61.1%. Among outpatient primary

care in the Meru khat growing area in Kenya, the prevalence of khat chewing for a sample of 100 patients was 29% (Omolo and Dhadphale, 1987a). In contrast, the figures reported by Othieno et al (2000) from different Kenyan rural and urban Health Centers attenders was as low as 10.7%.

2.2.2.3 Prevalence among homogenous younger age groups

The estimates of khat chewing among younger age group either in university, schools or out of school were reported as 5.6%-64.9% (Maru et al., 2003; Adugna et al., 1994). Adugna et al (1994) among 248 secondary schools students grade 9-12 in Agaro South Western Ethiopia reported high prevalence (64.9%) of khat chewing. Maru et al (2003), reported a khat chewing prevalence among children and young persons age 8-18 years appearing in the Nairobi-Kenya Juvenile court as 5.6%. In a study of drugs use among 479 students age 17-25 years, in Gondar medical and paramedical boarding college in North West Ethiopia, the prevalence of khat chewing was reported as 22.3% (Zein, 1988). Very recently, the prevalence has been estimated among a random sample of 1258 of college students aged 17-24 years of different health training backgrounds as 17.5% (Kebede, 2002 a). Other studies reporting the prevalence of khat chewing among homogenous younger age groups are presented in Table 2.4.

2.2.3 Prevalence time frames

The time frames reported for the prevalence of khat chewing varied. Studies (Table 2.1, 2.2, 2.3, 2.4) have adapted different patterns of recall of khat chewing. This time frame included, a point prevalence (Maru et al., 2003), a week before interview (Odenwald et al., 2005; Griffiths et al., 1997), a month before interview (Patel et al., 2005), in the last 30 days (Omolo and Dhadphale, 1987a; Belew et al., 2000; Kebede, 2002 a) and last year (Numan, 2004).

2.2.4 Pattern of khat chewing

This includes the frequency and quantity of khat chewing. The description of khat chewing frequency in the literature is varied. Belew et al (2000) reported current habitual khat chewing as daily (the prevalence as 17.9%), and more frequently as occasional (82.1%). Nouman (2004) reported khat chewing as once a week or less as occasional (16.2%), 2-3 days as light (29.9%), 4-6 days frequent (19.1%) and every day as heavy (34.8%). World Bank (2007) survey in Yemen reported that khat chewing more than three days per week as 'addictive' (total 38.7% and 10% for female) and balanced chewing as 1-2 days or less (15.3%). Ayana and Mekonen (2004) defined the pattern of khat chewing every day as regular (44%) and other patterns as once a week (29.9%) and occasional (25.6%). Kebede et al (2005) investigated the use of khat among in school and out of school children through using the Less than once a week (2.1%), once a week (11%) and every day khat chewing (7.7%). Patel et al (2005) and Griffiths et al (1997) reported as 10% and 6% Somalis chewed currently khat on daily basis in four cities in the UK and East London-UK. Griffiths et al (1997) reported less than seven days chewing as less frequent.

As for the quantity of khat chewing, in the diasporas amount of khat chewed was reported only by studies carried out in the UK. Yemeni community khat chewers often chewed Herari type khat from Ethiopia whereas the Somalis chewed Mirra type from Kenya (Kassim and Croucher, 2006; Patel et al., 2005). Griffiths (1998) reported 1-3 bundles chewed among 96% of Somali khat chewers and a range between 1-15 bundles. Patel et al (2005) reported that 48% of khat chewers chewed two bundles and 26% chewed three bundles and the rest more than three. The range was between one and six bundles and the mean was 2.5 bundles.

Kassim and Croucher (2006) reported the range of khat chewed among Yemenis in the UK as 0.25-3 bundles. Fifty nine percent chewed one and the rest 1.5 bundle and more. In khat producing countries, different definitions to the quantity of khat chewed were reported. Ayana et al (2002) and Gelaw and Haile-Amlak (2004) used the amount of money spent on khat chewing as a proxy for the quantity of khat chewed. Others used different definitions such as 'wrap' in Kenya (Ihunwo et al., 2004), 'marduuf' in Somalia (Elmi, 1983b), and 'bundle' or the leaves sold in a 'bag' in Yemen (Ali et al., 2004).

2.2.5 Quality assessment of khat chewing prevalence studies

According to the criteria adapted (Appendix 5B), 59.0% of the studies scored up to two out of eight criteria (Appendix 5C). The range of criteria scored by studies reporting khat prevalence was between 1 and 6 out of eight scores. Nine studies were carried out by self-administered questionnaire and the rest (35) were through face to face interview. However, validity (ascertaining of khat chewing through biochemical measures), validity and the reliability of data instrument were not reported by any study. The confidence interval of the prevalence of khat chewing, in a random sample, was reported by Alemu et al (2007) and by Odenwald et al (2007a) though convenience sampling in the latter study was adapted. The findings from two random community samples in khat producing countries were generalisable to >15 years old male and female (Belew et al., 2000; Ayana et al., 2002), in one study to only ≥15 years female (Khawaja et al., 2008) and among three homogenous younger age samples to 15-24 years old (Ayana and Mekonen, 2004; Kebede, 2002 a; Alemu et al., 2007). In diasporas, only one study's findings were generalisable to adult population (Bhui et al., 2003).

Table 2.2: Prevalence estimates of khat chewing in national and community population in khat producing countries

Author, year and country of study	Sampling frame	Number of male	Number of female	Sample size	Time frame	Data collection	Age	Prevalence		
								Overall%	Male%	Female%
Alem et al (1999), Ethiopia.	Rural community house holds Butijira in Ethiopia.	4397	6071	10468	Current	Face t o face interview	15^{+} yrs	50	70	35
Belew et al (2000), Ethiopian	Rural and urban households Ethiopian community	626	402	1028	Last 30 days	Face t o face interview	>15 yrs	31.7	40	18.2
Ayana et al (2002), Ethiopian	Jimma Town, W.Ethiopia	519	481	1000	Current	Face t o face interview	>16 yrs	30.6	61.13	23.9
Selassie (1996), Ethiopia	Ethiopia, 24 towns.	----------	----------	3200	----------	Face t o face interview	<15yrs	30.5	--------	----------
Mwenesi (1996), Kenya	Kenya, 22 disrricts.	----------	----------	2301	----------	Face t o face interview	6-90 yrs	4.1	--------	----------
Numan (2004), Yemen	Three urban and three rural areas households in Yemen	510	282	792	Last year	Face t o face interview	15-76 yrs	67.9	81.6	43.3
World Bank (2007), Yemen	seven of Yemen's 21 Governorates	2220	1807	4027	----------	Face t o face interview	12^{+} yrs	54.6	72.0	32.6
Khawaja et al (2007), Yemen	Data of Yemen Demographic and Maternal and Health Survey (YDMHS	**----------**	7343	7343	Recent last five year	Face t o face interview	15-49 yrs	40.7	**--------**	40.7
Elmi (1983b), Somalia	Hargesia and Mogadishu town and neighborhoods.	4526	2959	7485	Ever tried	Face t o face interview	16-78 yrs	59	--------	----------
Odenwald et al (2005), Somalia	Hargeisa households	2449	2405	4854	Recent last week	Face t o face interview	>12 yrs	10.2	--------	----------
Odenwald et al (2007a), Somalia	Military personnel of seven region of Somali	7238	886	8124	Recent last week	Face t o face interview	Average 37.3 yrs	36.4	--------	----------
Aden et al (2006), Kenya	Inhibitants of Ijara district	----------	----------	50	History of khat chewing	Face to face interviews	15-34 yrs	88	--------	----------
Tesfye et al (2008), Ethiopia	Population of Addis Ababa	1648	2353	4001	Current	Face to face interviews	25-64 yrs	8.7	18.3	1.9

Table 2.3: Prevalence estimates of khat chewing in studies using clinical samples of all age groups in countries producing khat

Author, year and country of study	Sampling frame	Number of male	Number of female	Sample size	Time frame	Data collection	Age	Prevalence		
								Overall%	Male%	Female%
Ali et al (2004), Yemen	Dental School, Yemen	1818	682	2500	Currently	Face to face interview	5-85 yrs	61.1	87.4	12.9
Omolo and Dhadphale (1987a), kenya	Outpatient primary care in Meru khat growing area,	50	50	100	Last 30 days	Face to face interview	----------	29	56	2
Mangel et al (1996), Yemen	Schools, clinics, university courses and private dental clinics in Sada, Sana'a, Aden and Taiz	517	484	1001	----------	Face to face interview	12-44 yrs	35.8	56	14.3
Hill and Gibson (1987),Yemen	Hospital, dental clinic attenders	121	----------	121	----------	Face to face interview	35 yrs	95	--------	----------
Othieno et al (2000), Kenya	Rural and urban health centers attenders	152	78	72	Life time	Face to face interview	12^{+}yrs	10.7	--------	----------

Table 2.4:: Prevalence estimates of khat chewing in studies using homogenous samples of younger age groups in countries producing khat

Author, year and country of study	Sampling frame	Number of male	Number of female	Sample size	Time frame	Data collection	Age	Prevalence		
								Overall %	Male%	Female%
Zein(1988), Ethiopia	College of medical and Paramedical in NW Ethiopia.	391	88	479	Last 30 days	Face to face interview	17-25 yrs	22.3	25.1	10.2
Kebede(2002a), Ethiopia	Four colleges of Gonder medical sciences in NW Ethiopia.	932	171	1103	Last 30 days	Self – administered questionnaire	17-24 yrs	17.5	----------	----------
Kassaye et al (1999), Ethiopia	Two schools from the capital Addis Ababa and the other rural from Butajira, Ethiopia	277	151	428	Ever used	Self – administered questionnaire	10-14 yrs	75.8	----------	----------
Adugna et al (1994), Ethiopia	Secondary schools' students Agaro, South West Ethiopia	148	100	248	Last 30 days	Self – administered questionnaire	15-22 yrs	64.9	71.6	55
Kebede et al (2005), Ethiopia	in-school and out-of-school youth in different region of Ethiopia	10236	10198	20434	Last four weeks	Face to face interview	15-24 yrs	15.3	----------	----------
Ayana et al (2004),Ethiopia	University students	109	363	472	Current	Self – administered questionnaire	16-46 yrs	24.79	27.0	17.43
Gelaw et al (2004), Ethiopia	Jimma university staff South West Ethiopia	330	70	400	Within last 30 days	Self – administered questionnaire	18+yrs	30.8	33.0	20.28
Ihunwo et al (2004), Uganda	South Western Uganda	127	52	181	Current	Self– administered questionnaire	21-25 yrs	20.4	----------	----------
Taffa et al (2002), Ethiopia	In-school and out-of-school youth in Addis Ababa , Ethiopia	334	227	561	Past used	Self-administered questionnaire	15-24 yrs	15	----------	----------
Maru et al (2003), Kenya	Juvenile in Courts in Nairobi ,Kenya	64	26	90	Point	Face to face interview	8-18 yrs	5.6	----------	----------
Alemu et al (2007), Ethiopia	Out-school youths northwest Ethiopia	324	304	628	Last 12 months	Face to face interviews	15-24 yrs	38	46	28.9
Gelaye et al (2008), Ethiopia	Nine colleges in Awassa, Ethiopia	1294	----------	1294	----------	Self-administered questionnaire	----------	30.5	30.5	----------
Arnold et al (2008), Ethiopia	Nine colleges in Awassa, Ethiopia in Awassa, Ethiopia	----------	1330	1330	----------	Self-administered questionnaire	20.6 yrs	12.7	----------	12.7

Table 2.4: (continued)

Deyessa et al (2008), Ethiopia	Butajira district in Ethiopia	----------	3016	3016	----------	Face to face interview	15-49 yrs	52.5	----------	52.5
Molla et al (2008), Ethiopia	Nine rural and one urban area in the Butajira Rural Health Programme (BRHP)	2184	2215	4399	----------	Face to face interview	15-24 yrs	22.2	----------	----------
Ross et al (2008), Tanzania	Dar el Salaam city, Tanzania	315	219	534	Last 30 days	Face to face interview	18-59 yrs	9.7	10.4	7.2
Laswar and Darwish (2009),Yemen	Aden University Medical students	100	----------	100	----------	Face to face interview	19-24 yrs	54.0	54.0	----------
Ageely (2009), Saudi Arabia	Jazan region of Saudi Arabia	4639	4326	8965	----------	Face to face interview	15 -25 yrs	21.4	37.7	3.8

2.2.6 Socio-demographic factors and prevalence of khat chewing

2.2.6.1 Gender, age, marital status and prevalence of khat chewing

The studies of prevalence of khat chewing in the diasporas and khat producing countries showed that khat chewing prevalence among males is higher than females. In diasporas, Wood (2005) reported that 64% males to 6% women chew khat among adults community sample of 220 Somlis resided in Sheffield. Bhui et al (2003) showed among a sample of Somali community adults, significant association between khat chewing and being male ($P<0.001$). Patel et al (2005) reported among Somali community in four cities of UK, the prevalence of khat chewing for males as 51% compared to 14 % for females (Table 2.1).

In khat producing countries, among adults community groups such as in Yemen the prevalence among males was 81.6% and 43.3% for females (Numan, 2004). In rural Ethiopia, Alem et al (1999) reported that 70% males chew khat compared to 35% females and the figures were 61.13% for males and 23.9% for females respectively, in Jimma town, W. Ethiopia (Ayana et al., 2002). Among a random sample of 1200 of rural adults' community in Ethiopia, Belew et al (2000) reported that 18.2% of females currently chew khat compared to 40% males. Zein (1988) among university students found higher prevalence of khat chewing among male students than females, 25.1% to 10.2% respectively.

Adugna et al (1994) reported among secondary school children the percentages of khat chewing were for males and females as 71.6% and 55% respectively. Clinical studies of khat chewing showed that the prevalence of khat chewing among males were 87.4%, 56%, 56% and among females were 12.9%, 2%, 14.3% respectively (Ali et al., 2004; Omolo and Dhadphale, 1987a; Mengel et al., 1996).

However, Khawaja et al (2008) in a survey recruited randomly females only; the prevalence figure of khat chewing was reported as 40%. World Bank (2007) showed that men reported 14% of their wives chew khat and the survey itself among females reported 33% of Yemeni females chewed khat. Therefore, as khat chewing is culturally disapproved for Somali women (Elmi, 1983b; Griffiths et al., 1997; Patel et al., 2005; Straus et al., 2005) and is approved only for married and older Yemeni women (Al-Motarreb et al., 2002b), the prevalence figures of khat chewing reported in some studies is inconclusive.

With respect to the age of initiation to khat chewing, Zein et al (1988) reported the onset of khat chewing among college students was at the age of 16.4 years. Adugna et al (1994) reported 50% of the secondary school students started khat chewing at the age between 11-14 years. Gelaw and Haile-Amlak (2004) among the staff of a university reported the onset as 10-15 years. Among a community population Alem et al (1999) reported the onset of khat chewing as between 10-15 years old and Belew et al (2000) reported the mean age of starting khat chewing was at 21 years old. Ali et al (2004) reported the age of initiation of khat chewing in Yemen was after 10 years. Patel et al (2005) reported a high percentage (46%) of Somali community khat chewers started khat chewing before the age of 19 years. However, Adugna et al (1994) and Patel et al (2005) reported small percentages (6% and 1.3%) of khat chewing initiation among Ethiopians and Somalis below the age of 10 years old.

The prevalence of khat chewing was reported to increase with age. Litman et al (1986), in a six months study among two villages in Jerusalem, reported that the percentage of chewers at age 40 years was 61% compared to 27% for 17-20 years old respondents. Belew et al (2000) reported among 15-24 years old

Ethiopians that the prevalence was 22.7% and increased to 69 % between the ages of 25-44 years old. Alem et al (1999) reported highest percentages of khat chewing between 25-44 years. However, Elmi (1983b) reported the peak of khat chewing was between 20-40 years and in line with these figures was Gelaw and Haile-Amlak (2004).

Khawaja et al (2008) showed in a population survey of women that the proportion of khat chewing among older married women 25-49 years old is higher than among young married women who were less than 25 years of age. This has been supported recently in a national survey which found that 3% of women below 20 years of age chewed khat more than 3 times per week, compared to 11% of women between 21-30 years of age, 18% of women between 31-40 years of age and 29% of women above 60 years of age (World Bank, 2007).

With respect to khat chewing and marital status many studies have shown that married men were more likely to be khat chewers than unmarried men. Gelaw and Haile-Amlak (2004) found in a sample of 400 university staff that khat chewing distribution was higher among married men. Ayana et al (2002) reported in a community random sample of Jimma in South Ethiopia that the distribution of khat chewing was higher among married (50.3%) than unmarried men and others. Alem et al (1999) reported that married men were more likely to chew khat than unmarried. Belew et al (2000) reported that the distribution (39.7%) of current khat chewing is higher among married. However, Alem et al (1999) reported a significant association ($P<0.001$) between being a daily khat chewer and being male, divorced, and also for being a widowed female ($P<0.05$).

2.2.6.2 Social origin of khat chewing

Khat chewing is suggested to be associated with Muslim religion. In Yemen where Islam is the main religion this is not reported in epidemiological studies. However in areas where many faiths live side by side, the studies showed that khat chewing percentage is higher among Muslim than other faiths. Gelaw and Haile-Amlak (2004) reported that among a sample of Ethiopian staff in Jimma University, Muslim khat chewers comprised higher percentage (49%) than other chewers from differnt faith backgrounds. Adugna et al (1994) reported among 161 khat chewers secondary school students, Muslim khat chewers students accounted for 56% compared to the Christian. Ayana et al (2002) reported significant associations between being a Muslim student and chewing khat. Alem et al (1999), in a community sample, reported Muslim chewers were higher in number than Christian and being Muslim (male or female) was highly associated with daily khat chewing.

In certain regions in countries producing khat like Ethiopia, khat chewing was reported to be initiated by family and friends chewing khat. Ayana and Mekonen (2004) among university students showed that there was a significant association between being a chewer and having a friend and a family member chewing. Among community sample which consisted mainly of Muslim, ten percent (10%) of khat chewers reported that they initiated their children to chew (Alem et al., 1999). Family and friends were behind initiation of khat chewing among 65% male and among 72% female Yemenis (World Bank, 2007). Aden et al (2006) reported that among 88% of khat chewers, 80% had a family member engaged in khat habit. The literature suggested that initiation of Somali females in the UK to khat chewing was by their spouse or partner (Griffiths, 1998).

In Ethiopia, khat chewing initiation among 48.2% respondents of national population study was reported to be by peer pressure (Selassie and Gebre, 1996). Among the Somali community in the UK initial access to khat chewing was most commonly through friends (Griffiths, 1998; Patel et al., 2005).

2.2.6.3 Khat chewing and socio-economic status (SES)

The rate of khat chewing was found to be apparently inversely associated with level of education completed. However, there was inconsistency in measuring level of education completed in relationship with khat chewing. Khawaja et al (2008) demonstrated that in a study in Yemen among married women who had a live birth in the past five years, using education as one of the socio-economic indices, khat chewing associated significantly with no education. Education completed was measured as no education or primary education and above. Litman et al (1986) found that khat chewing distribution was among 58% for chewers with up to 8 years of education and 32% among chewers with nine years and above education. The same was found among the rural Ethiopia khat chewers with higher education (above nine years) consisted 5% and the rest with no education or less than nine years education (Belew et al., 2000). In contrast, Alem et al (1999) reported higher education among male khat chewer. Ayana et al (2002) also reported similar findings. The education level was operationalized in Alem et al (1999) and Ayana et al (2002) as less than nine years is higher education or literate. Belew et al (2000) and Litman et al (1986) measured these levels as low. Gelaw and Haile-Amlak (2004) found no association between khat chewing and level of education. The entire sample was homogenous with respect to the education level (grade 12 and more). The distribution of khat chewing was 33% and 30% for technical hospital staff and academics in Jimma University.

Studies among homogenous groups such as students are contradictory to population studies. Khat chewing increases with advancing education and this is reported to aid studying and to improve performance (Zein, 1988; Adugna et al., 1994; Kebede, 2002 a; Laswar and Darwish, 2009).

Khat chewing and employment status differed between areas of studies. Belew et al (2000) showed in a sample of 1200 rural adults Ethiopian that 21.4% of a total of 31.7% of khat chewing prevalence was among employed farmers. In Yemen, Khawaja et al (2008) showed that there were not any differences in khat chewing among employed or unemployed women when adjusting for other variables (education, low wealth, rural residency and living in mountains). However, Ayana et al (2002), in a random community sample, reported that unemployed, students and housewives formed 61% of khat chewers.

Studies among communities chewing khat in diasporas such as UK showed that the frequency of khat chewing is higher among the unemployed (Kassim and Croucher, 2006). The percentage of older unemployed khat chewers was higher than employed younger khat chewers (Kassim and Croucher, 2006). Griffiths (1998) reported among a sample of 207 Somalis with 67% khat prevalence, higher unemployment among khat chewers. Nabuzoka and Badhadhe (2000) reported that among a sample of 94 khat chewers in the UK, 73% were unemployed. Ahmed and Salib (1998) reported the distribution of khat chewing was higher among unemployed khat chewers in Liverpool. In contrast, Patel et al (2005) reported among Somali khat chewers in four cities of UK, recruited through privilege access sampling, high unemployment among non khat chewers.

Studies reporting khat chewing and income of khat chewers are scarce in the literature. In areas where khat is cultivated there were no variations in khat chewing prevalence among chewers of different level of incomes. Alem et al (1999) reported that daily khat chewing among all levels of income of khat chewers was the same and the distribution of the prevalence of khat chewing was 22% for high income and 22% for medium and 19% among low income. This was supported by the findings from Yemen (Milanovic, 2008), though inadequacy of the data was acknowledged. However, the prevalence of khat chewing was reported higher amongst the better off in Djibouti which imports khat (Milanovic, 2008).

In summary, a range of khat chewing prevalence was reported in khat producing countries and diasporas. In the UK, a random sample of the Somali community in South London reported the prevalence as 24% (Bhui et al., 2003), whereas the largest sample of the Somali community of four UK cities recruited through privilege access interviewers 34% (Patel et al., 2005). Studies of Yemen's residents attending oral health care report a much higher prevalence whereas reported prevalence is generally lower amongst samples drawn from community settings. The opposite was reported for the studies of individual residents in Somalia. Importantly the quality of the studies using standardized criteria (Altman, 1991) reporting this prevalence is limited.

2.3 Impacts of khat chewing

The literature suggests a range of health, health risk behaviours (khat chewing association with tobacco smoking and dependency creating substances), socio-economic and environmental impacts associated with khat chewing and khat cultivation.

2.3.1 Khat chewing and oral health

Studies of the oral consequences of khat chewing amongst diasporas communities chewing khat are scarce. Kassim and Croucher (2006), reported amongst 75 Yemeni khat chewers in Sheffield associations of self-reports of oral problems with both khat and nicotine dependence. Somali khat chewers in East London reported discoloration of teeth, cuts, trouble eating and experiencing mouth infection after khat chewing (Griffiths et al., 1997). Oral cancer (squamous cell carcinoma) in the floor of the mouth in a 42-years-old-female khat chewer from Kenya was reported by Fasanmada and Newman (2007) in London. Also, smoking more than 30 cigarettes a day and drinking alcohol was reported for this case. Marker and Krogdahl (2002) reported in Somali khat chewer living in London, plasma cell gingivitis in the buccal sulcus where khat was placed. With the growing number of immigrants to the UK from khat producing countries (Somalia, Yemen and Kenya) research into the impact of khat on oral health has apparently not been considered.

In khat producing countries, the impacts of khat chewing on oral health was first reported in the form of professional observations such as stomatitis with secondary infection (Halbach, 1972; Luqman and Danowski, 1976). However, there is nowadays a handful of literature to suggest khat chewing impacts on different aspects of oral health.

2.3.1.1 Khat chewing and periodontal diseases

Studies into the impacts of khat chewing on periodontal disease are scarce. Hill and Gibson (1987) in a survey among 121 hospital attendees reported that the periodontal pocket depth in the side of chewing was less than on the non chewing side. This was supported by Mengel et al (1996). This suggested that khat had a

beneficial effect on the chewing side (Al-Hebshi and Skaug, 2005a). In addition, Mengel et al (1996) in a survey among 1001 Yemeni in different locations in Yemen reported that among 309 khat chewers the mean CPITN, the clinical loss of attachment and the calculus index among chewers was higher than non chewers. These differences were prominent among 12-24 years old khat chewers. Mengel et al (1996) in comparing the loss of periodontal attachment also found that among chewers was in the non khat chewing side whereas among non chewers there was no side specification. Ali (2007), in a cross section study among 2500 Yemeni, 1528 were khat chewers and 972 non chewers, showed that 31% of 1528 khat chewers had periodontal pockets and 98 had gum recession. Frequency and duration of khat chewing was associated with periodontal diseases ($p<0.05$).

In contrast, Jorgensen and Kaimenyi (1990), in a case-control study of 231 mirra (khat) chewers and 199 non khat chewers in Kenya, reported that the oral hygiene status of mirra chewers was generally better than non mirra chewers and no significance differences in average loss of attachment of teeth of mirra and non mirra khat chewers. The study concluded that khat is not a determinant of periodontal diseases. Al-Hebshi and Skaug (2005) reported in a cross sectional study among 51 male (29 khat chewers and 22 non khat chewers); age range 19-28 years with no systemic diseases conditions affected the periodontium that khat changed the subgingival periodontal bacteria among khat chewers. However, the findings were not incompatible with periodontal health.

It is noteworthy to highlight here that the above mentioned studies did not report validated criteria for measuring periodontal disease, selection criteria of

participants and control for other confounding factors such as systemic diseases and behavioural factors, particularly smoking, which was common among chewers. Therefore, the evidence of khat chewing impacts on periodontal status of khat chewers is inconclusive and needs further research.

2.3.1.2 Khat chewing and oral cancer

Recently the literature suggested that khat chewing habit is an emerging risk factor for the aetiology of oral cancer in the Arab peninsula and the Horn of Africa (Ali et al., 2004; Ali et al., 2006; Kassie et al., 2001) alongside other risk factors such as chewing betel quid and tobacco in India and south Asia continent (Critchley and Unal, 2003).

Hill and Gibson (1987) and Ali et al (2004), reported oral keratosis and white lesion due to mucosal changes caused by khat chewing among Yemeni Hospital and Dental school khat chewer attenders. In both studies, keratoses were reported in khat chewing side, often muco-buccal site. However, Hill and Gibson (1987) among the 50% of the white lesion of the surveyed 121 male volunteers did not investigate the associated behaviours with khat chewing such as tobacco use. Likewise, the pattern of khat chewing (frequency, amount and session duration of khat chewing) was not reported apart from the years of khat chewing. Ashri and Gazi (1990) reported a case of mousy brown gingival pigmentation linked to khat chewing with no signs of neoplasia.

Ali et al (2004), in a new grading system of white lesion based on consensus criteria, carried out a cross sectional study among an opportunity sample of 2500 Yemeni dental clinic attendees. Varied degrees of white lesion were reported in 342 (22.4%) of 1528 (1330 male and 198 female) khat chewers. The distribution

was 65 (32.8%) of 198 female khat chewers and 277 (20.8%) of 1330 total male chewers. This indicated that the white lesion occurs more in females than males. Severity of white lesion was associated with number of years and frequency of days of khat chewing. Among 90 (25.9%) self-reported khat chewing not using any form of tobacco, chewing khat was found as an independent risk factor for developing white lesion.

However, these self-reports of non-tobacco use were not validated and according to Newton and Bower (2005) multivariate analysis can be used to test complex causative models. The study concluded that khat provokes white lesions. The report of the white lesion for both studies mentioned above was based on the clinical features. Suspicions of dysphasia or malignancies were not validated with other measures such as histopathology analyses. Khat chewing and tobacco use (smoking or smokeless tobacco-ST) were not ascertained. Inadequate sampling method and absence of sample selection criteria that excluded patients with oral expression of systemic diseases meant that the results should be interpreted cautiously.

Ibrahim et al (1986) carried out a retrospective study to investigate the effects of khat and shamma (smokeless tobacco-ST) on oral mucosa. Amongst 64 patients (56 male and 8 female) with squamous cell carcinoma of head and neck, 52 of them either used ST or both ST and khat. Of these 52 patients 38 had oral cancer of whom 16 used ST alone and 22 used both khat and ST. The other 14 of 52 cases developed pharyngeal and laryngeal cancers. Duration of use (median) for ST and khat were 15 and 12 years respectively. Frequent use of both habits and the social context of use were not reported. The potential combined effects of khat

and tobacco on oral mucosa was postulated as one agent is initiator and the other promoter of oral cancer. These findings have been recently underpinned by Scheifele et al (2007). In a non probability sampling of 200 shamma chewers (199 male and one female) in eight villages in Yemen for assessing oral lesion associated shamma chewing, Scheifele et al (2007) reported mucosal burns (MB) accounted for 31% and oral leukplakia (OL) homogenous or non homogenous for 27%. Homogenous and non Homogenous OL in the ventral, lateral, dorsal and base of tongue accounted for 24%, followed with the buccal vestibule and mucosa 39%. In contrast MB was most frequent at the floor of the mouth 32% followed with the buccal vestibule and mucosa vestibule 31%. Within the same study shamma chewers with OL, when were compared with shamma chewers without any mucosal lesion, heavy khat chewing more than six hours/day (OR= 4.22, 95%CI=1.43-12.43, p< 0.009) and frequent of shamma use more than ten application/day (OR=4.90, 95%CI=1.99-12.08 p<0.001) were found predictors of developing OL. Also comparison between shamma chewers with OL and shamma chewers with MB showed khat chewing more than six hours/day (OR=3.02, 95%C=1.08-8.38, p<0.034) and higher frequency of shamma use (more than ten application/day) were predictors for OL.

In a retrospective study, Soufi et al (1991) reported head and neck cancers among 28 patients who lived in border areas of Yemen and Saudia Arabia. The histopathology of these findings was confirmed. Habitual khat chewing was reported by ten of these patients of whom eight had oral cancer. The ratio was 3:5 male to female. Though patients reported long years using khat (25years), lesion sites of oral cancers were varied and some of them with no contact with khat bolus. This could raise the assumption that khat was used with ST (shamma).

Nasr and Khatri (2000), in another retrospective study showed that among 36 Yemeni patients (23 male and 13 female) from head and neck cancer, 30 patients were habitual khat chewers with an age range between 18-80 years. Oral cancer, confirmed with histopathology analysis, was reported among 17 khat chewers who also were ten ST users and five tobacco smokers. Among these 36 cancerous cases the socio-economic status for 28 was low. Measurement of low socio-economic status was not reported. However, the findings were inconclusive as it had not been established whether cancer was due to khat chewing with tobacco smoking /ST use or without any form of tobacco use or other risk factors such as dental, nutritional factors or alcohol abuse. This was underpinned with the report of site of oral cancer associated with the placing site of ST (shamma) such as lower lip and floor of the mouth. The literature reports khat bolus placed often on one of the buccal sulcus of the mouth with the buccal vestibule mucosa and the lateral side of the tongue are in contact with khat (Sawair et al., 2007).

Over the period of 1996-2000, 1491 malignancies for different site of the body from different hospitals of Yemen were reported to Al-Thawra Hospital in Yemen, which receives most of the referrals in the country. Head and neck malignancies consisted of 128 cases of which 65% were reported as squamous cell carcinoma. Oral cancer comprised 73% of these 128 cases (Al-Thobhani et al., 2001). Apart from the missing data for the blood system tumors, Sawair et al (2007) using the 2004 records for the same hospital, reported recently that oral cancer was the most frequent (18% of 649) body cancer in both males (17.2% of 348) and females (19.6% of 301). Squamous cell carcinoma (SCC) was the most frequent oral cancer (84%). The most common sites were reported in tongue (42%) for both males and females, in muco-buccal (20%), gingiva (23%) and the rest (15%) in

other sites such as lip (10%). Among the 119 oral cancer cases, data was available for 92 (77%) patients for habits of chewing (khat and ST) and tobacco smoking. Both chewing khat and ST were postulated in the etiology of frequency of SCC. However, other information such as the socio-economic status of patients and area of residency in Yemen were not reported. Importantly, specification of oral lesion site such as dorsum, lateral or ventral site of tongue have masked the association of whether oral lesion due to khat, shamma chewing or both.

In a case-control matched study (age, gender and ethnicity) among a random sample of 102 Jewish Yemeni carried by Gorsky et al (2004), cases consisted of 47 male khat chewers of whom 32 were tobacco smokers and khat chewers and 15 non tobacco smoking khat chewers. For the two chewer groups the mean years of chewing were 24 years. No differences in number of days (3.5, 3.33) and hours of chewing (4.12, 3.5) were reported between the two groups. However, white lesions were detected in 12 out of 15 non-smoker chewers and in 27 out of 32 smoker chewers. The 55 controls non-khat chewers comprised of 25 smokers and 30 non-smokers. White lesions were detected among 5 out of 25 smokers compared with 4 out of 30 non-smokers. In total white lesion identified in 83% khat chewers and in 16% controls non-chewers ($p< 0.001$). White lesion was reported in the muco-buccal fold at the second molar among khat chewers. Chewing smokers were reported to smoke more than smoking non-chewers and the mean was 29.5 compared to 23.3 cigarettes per day respectively. This difference was reported as significant ($P< 0.03$). An insignificant difference in the occurrence of white lesion between smoker chewers and non-smoking chewers was reported using bivariate analysis. This indicated that smoking is not a confounding factor. Forty-one of white lesions out of 48 for both cases and controlled were

homogenous and five of seven non homogenous were in khat chewers. The literature acknowledged that non homogenous white lesions were internationally reported to be as aggressive (Axell et al., 1996). Though this study is considered of a good quality design compared to the above reported studies, the internal validity of the study was undermined due to the fact that the malignancy report was based on clinical appearance but was not validated with further histopathological test. Additionally, the criteria of diagnosis of oral mucosal diseases were not reported.

Ali et al (2006) studied 70 oral biopsies of Yemenis. Group one (G1) consisted of forty chewers' biopsies, among them 17 tobacco smokers and 23 non-tobacco smokers, were taken from the chewing side (muco-buccal). Group two (G2) was of 20 chewers biopsies, among them 11 tobacco smokers and 9 non tobacco smokers, were taken from non chewing sides. Group three (G3) consisted of 10 biopsies taken from the oral cavity of non-chewing non-smoking participants. The findings showed that khat chewing is associated with histopathological changes in the oral mucosa at the side of chewing without evidence of malignancy. Significant differences were reported between G1 and G2 and between G1 and G3 ($p<0.002$). Insignificant differences were demonstrated between the biopsies of chewers, whether were smokers or not.

Recently growing evidence reported that khat has independent genotoxic effects with possible carcinogenesis on human cells (Kassie et al., 2001; Lukandu et al., 2008; 2009). Kassie et al (2001) in a case–control study among khat chewers and non khat chewers demonstrated the genetic damage caused by khat on the oral mucosa of khat chewers. A dose response relationship was reported and this was

potentiated with the use of alcohol and tobacco. The study suggested that khat might play a role in oral malignancies. However, Dimba et al (2003; 2004) reported that a standardized extract of khat (catha edulis) in vitro induced a cell death in various human leukaemia cell lines with limited toxicity to peripheral blood mononuclear cells. This indicates that khat could be used as an anti-cancer treatment.

In the light of these reports, studies suggest that the white lesion occurred in the site (muco-buccal) where khat is chewed which might be due to the mechanical friction of khat chewing over long years (Soufi et al., 1991; Hill and Gibson, 1987; Gorsky et al., 2004; Ali et al., 2004; Ali et al., 2006). This should also be corroborated with cytotoxic effects of khat on oral mucosa cells (Kassie et al., 2001; Lukandu et al., 2008). Likewise, the pattern of khat chewing (frequency of days, duration of chewing hours and years) and other risk factors that is associated with the formation of a white lesion.

It is noteworthy to acknowledge that the results of above reviewed literature of khat chewing impacts on developing hyperkeratosis and dysplasia should be interpreted cautiously due to the following: a) Studies reported khat chewing and formation of white lesion in the site where khat is chewed lack validity to these findings. In other words, literature reported as well white lesion in the same site where khat is placed among shamma chewers. b) Inadequacy in studies' designs namely sample selection. c) Lack of controlling for other risk factors such as pesticides in khat and alcohol consumption, which is one of the determinants to oral cancer. d) The link of frequent chewing with the social context on one hand and with health outcome on the other hand has not been explored.

2.3.1.3 Khat chewing and other oral health problems

Evidence linking khat chewing with dental caries is still absent in the current literature. High caries experience is seen in heroin users and this perhaps caused by the combination effect of xerostomia caused by opiate and the high sugar contents of oral methadone solutions to manage withdrawal from the drug (Robinson et al., 2005). The use of sugared methanol or sugar cubes amongst khat chewers to counter the taste of khat was reported (Dhaifalah and Santavy, 2004) as well as the use of soft drinks (Kassim and Croucher, 2006) which are risk factors for dental caries (Sheiham, 2001). The combination of the xerostomic effect of khat, through its main component cathinone (Halbach, 1972), and the consumption of sugar in dental caries experience among chewers has yet to be explored.

The literature suggests the link of khat chewing with Temporo-mandibular joint (TMJ) problems. Walter (1996) reported a broken jaw due to driving under the influence of khat chewing and alcohol. TMJ pain in the side of chewing was reported by Hill and Gibson (1987) amongst 40% of 121 surveyed chewers. Reconstruction of the temporo-mandibular joint for chronic subluxation and dislocation amongst seven habitual khat chewers were reported by Kummoona (2001). Hill and Gibson (1987) observed universal dental occlusal attrition among chewers.

Finally, khat is proposed to have analgesic effects (Nencini and Ahmed, 1982; Connor et al., 2000). Amongst Bangladeshi women smokeless tobacco chewers oral pain was reported as a barrier to stop chewing (Croucher et al., 2003) and this was attributed to that tobacco analgesic effects (Erenmemisoglu et al., 1994) that

may mask the pain symptomatic of dental diseases and their sequelae. The combined effects of khat as a vasocostrictive substance (Al-Motarreb and Broadley, 2003) that causes ulceration and atrophy of the tissue as is the case for cocaine users (Robinson et al., 2005) alongside its effect as an analgesic awaits future exploration amongst khat chewers.

2.3.2 Khat chewing and general health

2.3.2.1 Khat chewing and cardiovascular system problems

There is growing evidence to suggest that khat chewing increases the risk of cardiovascular diseases such as high blood pressure and acute myocardial infarction through its main constituent cathinone (Brenneisen et al., 1990; Halket et al., 1995).

Widler et al (1994), showed in a clinical controlled study among six volunteers who were not habitual khat chewers, an increase in blood pressure within 2 hours after taking khat and this was associated with increase in the cathinone level in the blood plasma. In line with this study, Hassan et al (2000) observed amongst 80 healthy volunteers during a three hours period of chewing fresh khat leaves, there was a significant and progressive rise in systolic and diastolic blood pressure and heart rate. These levels had not returned to baseline one hour after chewing had ceased which the literature suggests as the cathinone indirect sympathomimetic that facilitate the release of catecholamines from the sympathetic nerve (Kalix, 1983). In a cross sectional random sample of 1000 community subjects in Ethiopia, Ayana et al (2002) reported that among 306 regular (daily) khat chewers 23% were found to be hypertensive. Hassan et al (2005), in a randomized double-blind clinical trial amongst sixty three male volunteers who chewed khat on three separate occasions for three hours, the effects of khat chewing on systolic blood

pressure and pulse rate was antagonised by the use of Atenolol (selective beta-1 adenocepter blocker).

Tesfaye et al (2008), in a random sample of 4001 males and females aged 25 to 64 years in Addis Ababa, using the WHO instrument for stepwise surveillance of risk factors for chronic diseases (blood pressure) both current regular khat chewing and smoking were found in multiple regression analysis to be associated with elevated mean diastolic blood pressure (P = .03 and P = .02, respectively). In a clinical trial among 8 habitual chewers and 5 naïve chewers, increase in blood pressure was observed amongst the two groups after chewing khat. However, increase in diastolic pressure was more marked in naïve chewers. Tolerance to the effect of chewing in habitual chewers was postulated (Nencini et al., 1984).

The literature reported the role of khat chewing in acute myocardic infarction. Of one hundred and fifty seven patients with acute myocardic infarction, who were admitted to hospital in Yemen, 79% were regular khat chewers. This study highlighted that a specific timing of myocardic infarction worldwide occurs in the early morning; in khat chewers the trend was reversed. Fifty nine percent reported onset between 2:00 pm and midnight, which is associated with khat chewing time (Al-Motarreb et al., 2002a).

In Yemen, a hospital based case-control study among one hundred and twenty patients with myocardic infarction (cases) and 120 normal healthy volunteers (controls) was carried out. The results showed that 79% of 95 patients with myocardic infarction were khat chewers and only 21% were non-khat chewers (Alkadi et al., 2002). Flaws in the methodology of this study such as definition of

the disease among cases and the selection bias of cases and controls made its result to be treated with caution.

Tobacco use is common in khat sessions and amongst khat chewers (Luqman and Danowski, 1976; Lenard and Al-Sabry, 1995; Griffiths, 1998; Kassim and Croucher, 2006). Tobacco smoking or exposure to second hand smoke is one of the established determinants of cardiovascular disease (Jonas et al., 1992; Law et al., 1997; Teo et al., 2006). In the above studies (Alkadi et al., 2002; Al-Motarreb et al., 2002a) these risk factors (tobacco and second hand tobacco) were overlooked. Besides, the validation of khat chewing through reliable measures such as cathionone (biomarker characteristic of khat chewing) or its metabolites in urine, saliva or blood was not reported. Importantly, social determinants of such behaviour such as socio-economics status of chewers and psychosocial factors have been overlooked in both studies.

Further studies to the role of khat chewing in acute myocardial infarction were undertaken. Between 1997 and 1999, a hundred admitted patients with acute myocardial infarction (AMI) to Sana'a-Yemen hospital were selected. These cases were matched for sex and age with a hundred control subjects recruited from the outpatients' clinics of the same hospital. The risk associated with each classical factor such as tobacco and lipid concentration and khat chewing habits was investigated. Dose-response of khat chewing (measured by the number of 6 hours or more chewing khat per day) and AMI among cases was observed. Heavy khat chewers (chewing more than 6 hours a day) were having a 39-fold increased risk of AMI (Al-Motarreb et al., 2005). Dose-response of cigarette smoking (measured by smoking more than 20 cigarettes per day) and AMI among cases was also

observed. Heavy smokers were having a 32.98 increased risk of AMI. The author argued that smoking cigarettes has no influence in AMI amongst cases.

However, the internal validity of this study was compromised. The two groups in this case-control stuy were not comparable. In other word, more unemployed, retired and manual khat chewers, fewer civil servants and senior managers amongst cases were observed. Other socio-economic position indicators such as recommended in epidemiological studies (Liberatos et al., 1988) were not used. The path through which the socioeconomic background had acted had not been described. Absence of other psychosocial factors that could influence khat chewing behaviour and AMI was one of the drawbacks of the study. Blindness of the assessors was not as well reported. Therefore bias may be inevitable. Whilst tobacco use was investigated, self-reported tobacco use was not validated with reliable measure such as the biochemical markers of tobacco cotinine in saliva, blood or monitoring expired carbone monoxide (CO) (Jarvis et al., 1987).

Reporting smoking status is affected by situational factors. According to Jarvis et al (1987) self-report of smoking status may not be always reliable particularly when smoker is under strong pressure to give up. A desire to smoke tobacco among 81% of khat chewers diagnosed with AMI compared with only 15.2% non chewers was reported by the same author in other study (Al-Motarreb et al 2002a). Further, according to Hennekens and Buring (Hennekens and Buring, 1987), an observed dose-response relationship could reflect merely the effect of an uncontrolled confounding factor. The argument put by the author that long hours of chewing was a risk factor for the AMI could be not true and this is for the following reasons: First, there is growing evidence to an increase of tobacco smoking during chewing. Therefore, if long hours will be associated with increase in the amount of

khat, the concurrent consumption of tobacco and its increase during chewing would be treated with the same manner. Therefore, it is difficult to distangle the effect of khat from that of smoking. Second, the type of khat and its possible contamination or not with chemicals (pesticides) was not reported. Finally the study failed to control for the traditional risk factors such as blood pressure as well as age. In summary, though this study showed the relationship of khat chewing with the AMI, the methodology shortcomings indicated that the results should be interpreted with caution.

Other vascular complications associated with khat chewing were reported. In a case control study, in bivariate analysis, acute cerebral infarction (ACI) was found to be associated with an increase of high blood pressure and khat chewing amongst patient than control groups (Mujlli et al., 2005).

In the UK and other diasporas countries, case reports of khat chewing and heart problems and ACI were reported. (Saha and Dollery, 2006; Kuczkowski, 2004; 2005; Vanwalleghem et al., 2006). Informal reports from the Sheffield City Council (2006) showed that Yemeni groups of all ages are among the groups more likely to be treated for coronary heart disease problems. The latter did not report khat chewing amongst these Yemeni patients. Therefore, the literature's suggestion of khat chewing association with heart problems awaits exploration amongst UK-Yemeni khat chewers.

2.3.2.2 Khat chewing and gastrointestinal tract problems

Early clinical observations reported that khat impacts on the gastrointestinal tract in the form of gastritis and loss of appetite and these were most often described in chronic khat chewers (Kennedy et al., 1983; Halbach, 1972; Luqman and

Danowski, 1976). Gastritis was postulated due to delayed gastric emptying that was associated with gastro-oesophageal reflux (Heymann et al., 1995). Loss of appetite is a characteristic effect of amphetamine substances and synthetic norpseudoephedrine (Halbach, 1972). Reduction in food intake and body weight when khat amines (cathine and cathinone) were administered on rats acutely or were given chronically (Zelger and Carlini, 1980).

The impacts of khat chewing on appetite was demonstrated amongst humans by Heymann et al (1995) who reported that chewing khat leaves for two hours prolonged the gastric emptying of semi-labelled meal amongst 12 healthy volunteers compared to the results when chewing lettuce leaves as a control. The clinical effects of khat on the appetite were assessed also amongst six subjects who chewed khat and lettuce in different days. Cathinone level during khat chewing was found to be associated with subjective reports of fullness. These reports were underpinned with no change in the levels of peptides responsible for regulating appetite. The anorexic effects of khat (loss of appetite) independent of gut peptides was suggested to be due to central sympathomimetic mechanisms mediated through cathinone in khat (Murray et al., 2008).

Hassan et al (2002), in a prospective study investigated the subjective effects of khat chewing among 1600 adult male occasional chewers who chewed for at least four hours a day for three successive days and 1600 volunteers who never chewed khat (comparisons). Symptoms of poor appetite (OR=51.77, 95%CI= 30.93-86.67, p <0.0001) were significantly higher among khat chewers. However, the results from this study should be interpreted cautiously as the measurements and validation of subjective effects of khat chewing were not established. Risk

related factors such as the medical history, validation of self-reported consumption or not of tobacco and the socio-demographic characteristics of recruited subjects on both arms of the study were not reported. Clinicians reported improvements in appetite among patients stopped khat chewing (Al-Motarreb et al., 2002b; Luqman and Danowski, 1976). Prospective studies to validate such findings have not been conducted.

Kennedy et al (1983), through recruiting a sample of 706 male and female Yemeni from different sites of Northern Yemen, showed that the statistical association of khat chewing with anorexic effects of khat chewing disappeared after adjusting for both effects of age and residency among females. A reduction in the odds ratio (from 2.69-2.64) for males was observed. The odds ratio of khat impacts (gastritis) reduced from 1.74-1.39 and from 23.71-6.89 for both male and female respectively. Loss of weight was observed among primary health clinic khat chewers' attendees in Kenya (Omolo and Dhadphale, 1987a). Belew et al (2000) in a community random sample of 1200 in Ethiopia showed that there was an association between current khat chewing and malnutrition (OR=1.76, 95%CI=1.24-2.48, $p<0.0007$) and daily khat chewing and malnutrition (OR=1.63 95%CI=1.11-2.55, $p<0.0007$). These associations were validated with body mass index (BMI). However, the other covariates related to malnutrition were not incorporated in the multivariate analysis. Therefore, the results should be interpreted cautiously.

Irrigation or use of pesticides in khat horticultural practice and its effects on general health of chewers has been explored. One study, that recruited khat chewers from two different mountainous villages cultivating khat in Yemen,

investigated the subjective health impacts of chewing contaminated and non contaminated khat (Date et al., 2004). Sixty percent of 52 khat chewers recruited from the village using chemicals for khat cultivation reported chronic health symptoms such as weakness, runny nose compared to 19% of 62 khat chewers in the other village cultivating non contaminated khat. Being a farmer or khat chewer from the village that cultivated contaminated khat (validated with khat analysis) were predictors of chronic health symptoms compared with other village counterparts. However, methodological inadequacy such as selection bias of both cases and controls, validation of self-reported findings, controlling of other confounders and not reporting blindness of the assessors suggested the results should be interpreted cautiously. Recently, Al-Akwa et al (2009), demonstrated in a case controlled study among 20 khat chewers and 20 non-khat chewers role of habitual khat chewing contaminated with pesticides in inhibition of antioxidants enzymes, a defense mechanism against pathogenesis.

Khat chewing was reported to be associated with constipation. An animal model demonstrated constipation and spasmolytic effects due to khat ingestion (Makonnen, 2000). Chewers tackled the constipation effects of khat by taking fatty meal before chewing (Kalix and Braenden, 1985). Constipation is also accompanied with haemorrhoids (Luqman and Danowski, 1976). A significant association between the habit of khat chewing and the development of haemorrhoidal diseases was reported (Al-Hadrani, 2000). In addition, chewing khat was found to affect the absorption of antibiotics namely, ampicillin, in human (Attef et al., 1997).

Finally, the incidence of oesophagus and stomach cancers in Yemen is reported to be higher amongst individuals who chew khat and smoked water pipes (Gunaid et al., 1995). The independent effects of both khat and smoking were not established due to a small sample. Recently, Heymann et al (1995), postulated that the delay in gastric emptying might prolong contact between dietary carcinogenic elements and the stomach. In addition, the impacts of nitrosamine formation from different khat (catha edulis) leaves extracts under simulated gastric conditions were as well postulated (Al-Mamary et al., 2006). The effects of these factors either independently or synergistically have yet to be identified.

2.3.2.3 Khat chewing and genitourinary system problems

Literature showed conflicting information on the effects of khat either chewed or used as extract on the reproductive parameters of both animal and human. The deleterious effects of khat on semen parameters have been reported for animals (Islam et al., 1990; Islam et al., 1994). Al-Mamary et al (2002) suggested that khat enhances spermatogenesis and has no deleterious effects on the testis of rabbits. Laboratory studies among mouse and human sperm suggested that khat metabolites (cathine and norephedrine) might enhance neutral fertility through the mechanisms of acceleration of capacitation and inhibition of spontaneous acrosome loss (Adeoya-Osiguwa and Fraser, 2005).

In a case-controlled study of a group of Yemeni khat addicts (65) and Yemeni non-khat chewers(50), matched by age and educational and socioeconomic status, el-Shoura et al (1995) reported the deleterious effects of khat addiction on semen parameters (volume, count, motility and normal form). Impacts of khat chewing were reported as prominent among chewers who chewed khat over 15 years. However, method of selection of both groups was not reported, the age ranges

was wide in both groups, the measurement of the socioeconomic statue indicators were not reported and the pattern of khat chewing among chewers was only reported as chronic. The exposure (khat chewing) should be more explicit in terms of the number of years and the frequency of khat chewing whether daily, per week or monthly (Ali, 2005). In addition, the synergistic or additive effect of other confounders such as tobacco and alcohol were not investigated.

Khat is reported to increase libido among both sexes (Luqman and Danowski, 1976; Elmi, 1983b). Though the effects vary in accordance to the variety of khat chewed, impotence, spermatorrhoea, precocious ejaculation, and reduction of performance amongst men were also reported (Elmi, 1983a). Bentur et al (2008) recently reported the use of khat capsule (200 mg of cathinone) 'Hagiggat' as a 'natural stimulant and aphrodisiac for men and women'. Hassan et al (2002), in a prospective study among 1600 adult male khat chewers and 1600 non khat chewers, reported post khat chewing spermatorrhoea (OR= 43.83 95%CI =24.74-77.64 $p<0.0001$) and weak stream of micturition (OR= 2.37 95%CI =1.41-3.98 $p<0.0001$) among khat chewers. These later findings were earlier reported by Nasher et al (1995).

Dawit et al (2005) commented that khat chewing leads to strain on family relations either through increased sexual arousal or spermatorrhoea and most likely multiple sexual practices. In a recent case-control study among 425 HIV positive cases and controls, Dawit et al (2005) gave more insight into the impacts of khat chewing on the spread of HIV in Ethiopia through multiple sexual practices. Khat chewing in conjunction with alcohol intake and casual sex was observed more in people with HIV than in the control group. Khat chewing was significantly

associated with multiple sexual practices among cases (OR = 4.03, 95% CI= 3.02-5.39), which in turn were strongly linked with HIV cases (OR = 3.52, 95% CI= 2.64- 4.69). Khat chewers constituted a significantly higher number of HIV cases (OR=2.32, 95%CI= 1.75-3.07). A cluster of risk factors for being HIV positive increased with khat chewing (OR =1.96, 95%CI=1.59-2.33), with multiple sexual practices (OR= 4.68 95%CI= 4.30-5.06), among age group at or above 31 years (OR=2.05, 95%CI= 1.6-2.44), being female (OR=2.71, 95%CI= 2.34-3.08), married (OR=2.09,95%CI= 1.71-2.46), less educated (OR=2.67,95%CI=2.34-3.01) and being Christian (OR=1.62, 95%CI=1.22-3.08).

Studies of the impact of khat chewing on pregnancy outcomes are scarce. Abdul Ghani et al (1987), in a hospital-based study that recruited pregnant women in many sites in Northern Yemen, reported that the off spring of habitual or occasional women khat chewers had low birth weight. However, absence of validity of the measures of low birth, absence of ascertaining of khat chewing and not reporting blindness of the assessors made the results questionable. Besides, while the impact of khat chewing on pregnancy outcome in term of low birth weight could be associated with the anorexic effects of khat chewing on pregnant woman khat chewers (Hassan et al., 2002; Murray et al., 2008), impacts of tobacco smoking (shisha, Madaa, cigarettes) which often associated with khat chewing has to be treated with the same manner. There is overwhelming evidence of tobacco effects, whether active or passive tobacco smoking, on a range of pregnancy outcomes such as low birth weight (Nuwayhid et al., 1998; Windham et al., 2000; Leonardi-Bee et al., 2008). *A*djustment for other factors such as nutrition, socioeconomic status and age of mother that the literature reported to be

associated with low birth weight (Khatun and Rahman, 2008) should be as well considered when assessing pregnant women khat chewers.

Recently, Al Harazi and Frass (2008) in a prospective study amongst pregnant women (1554) in Yemen, found that chewing khat during pregnancy was associated with low baby birth (<2500 g) amongst chewer mothers (31% of 1154) compared to non-chewer mothers (16% of 400). However, the authors acknowledged the role that could be played by uncontrolled factors such as tobacco use and pesticides in khat.

2.3.2.4 Khat chewing and psychological problems

The link of khat chewing with mental disorders such as psychosis and khat dependence is still debated. In a recent critical review, Warfa et al (2007) pooled and assessed the evidence from both clinical cases and quantitative studies. Multi dimensional differences in health and social care were suggested behind experiences of mental disorders among khat chewers. The main focus of this study is khat dependence which is described in the following section.

Khat is classified as a 'dependence-producing drug' (Nahas, 1981). Kennedy and Hurwit (1978) argued that khat chewing is habit-forming rather than addictive, and Yemenis who live abroad do not suffer from addiction symptoms. Nencini et al (1989) speculated also that higher potential of khat abuse is untenable since the bulk of khat limits its use and taste of khat is unpleasant, the cathinone in khat is unstable and the strength of khat acquired as a habit is stronger than its positive reinforcer. However, Kalix (1987) contradicted these views and suggested that khat is an addiction. There is a massive consumption of khat in Kenya and Djbouti where there is less social pressure to participate in khat sessions. This view can

be observed nowadays in many European countries, which have received migrations from East Africa and the Arabian Peninsula.

According to Gossop (2000) 'We cannot hope to understand the complexities of drug taking by studying either the drugs or those who take them in isolation from the social context'.

Recently, Feyissa and Kelly (2008) reviewed comprehensively the neuropharmacolgical properties of khat. Cathinone in khat was found to resemble amphetamine chemically, in its effects and behaviourally (Kalix, 1990; Woolverton and Johanson, 1984; Kalix, 1982). As for the effects, both cathinone in khat and amphetamine operate through the similar mechanisms. Cathinone in khat releases dopamine in rat nucleus accumbens tissue which is a characteristic of an addictive substance (Kalix, 1982).

Drug dependence/addiction is defined as "A state, psychic and sometimes also physical, resulting from the interaction between a living organism and a drug, characterized by behaviour and other responses that always include compulsion to take the drug on a continuous or periodic basis in order to experience its psychic effects, and sometimes to avoid the discomfort of its absence" (Nahas, 1981). Tolerance may or may not present. Nahas (1981) defined khat as a stimulant that creates psychological and minor/if any physical dependence.

Psychological dependence is reported as more important in drugs that are not physiologically based such as alcohol (Gossop et al., 1995; Topp and Darke, 1997). Psychological dependence amongst amphetamine users has been reported (Topp

and Mattick, 1997 b; Topp and Darke, 1997; Gossop et al., 1995). Studies exploring psychological khat dependence among khat chewers are scarce.

Griffiths (1998) and Kassim and Croucher (2006) suggested psychological khat dependence amongst resident Somali and Yemeni chewers in London and Sheffield, using the validated measure Severity of Dependence Scale (SDS) (Gossop et al., 1995).

Tolerance and withdrawal symptoms are characteristics of amphetamine. Withdrawal is an adaptive state which manifests itself by the appearance of intense physiological and psychological discomfort due to the suspension of the drug (Nahas, 1981). The khat related withdrawal symptoms, rebound phenomena, that included lethargy, nightmares, feeling hot in the lower extremities, desire for chewing khat in the first two days and slight trembling that lasted for a few days after cessation of khat chewing was anecdotally reported by Halbach (1972), Luqman and Danowski (1976), Kennedy and Hurwit (1978) and Al- Habori (2005). Empirical researches that explored the physical dependence of khat are scarce.

Alem et al (1999), reported that 0.6% chewers continued to chew khat to avoid withdrawal symptoms, though these symptoms were not specified. Chewers interviewed by Gelaw and Haile-Amlak (2004) reported that avoidance of unpleasant feelings and depression were the reasons to continue chewing khat. The confounding effects of reducing smoking when abstaining from chewing which includes irritability, sleep disturbance and depression (American Psychiatric Association, 2000) should be taken into account as well.

Tolerance is described as the necessity to increase the dose of a drug in order to obtain the initial psychotropic effects (Nahas, 1981). Drug dependence is often

associated with drug tolerance (Koob, 1992). Eddy et al (1965) reported that the naturally limited dose of khat is assumed to prevent the occurrence of tolerance to khat. However, what Eddy et al (1965) stated may not reflect the current pattern and social context of khat chewing among different communities such as the Yemenis and Somalis in diasporas or khat producing countries.

One can argue that the texture of the Kenyan khat (Miraa) which is often chewed by Somalis is soft and the chewers as stated (Elmi, 1983b) swallow the wad of khat, thus, the possibility of increasing the amount chewed is inevitable. Among the Yemeni khat chewers in diasporas who mainly chew Herari Khat, texturally similar to Yemeni khat, (Kassim and Croucher, 2006), this type of khat has bulky texture, however, spitting part of the old khat and adding new has been observed by the researcher of this study. In Yemen, Sawair et al (2007) reported that khat is spitted out after khat juice is swallowed and then chewers started again after rinsing their mouths or renewed khat in long hours of chewing. Prolonging hours of chewing over several days was also suggested to be a different way of tolerance development (Odenwald, 2006). Additionally, the current use of khat as capsules 'Hagiggat' may allow developing tolerance (Bentur et al., 2008).

Kassim and Croucher (2006) and Nencini et al (1984) among Yemeni and Somali khat chewers, reported an increase in the amount of khat chewed among older and habitual khat chewers. Griffiths (1998) and Patel et al (2005) reported among Somali chewers an increase in the amount of khat chewed. In animal studies results showed a decrease in the effects of the chronically administrated drugs (cathinone and amphetamine) and the dose response for amphetamine increased by twofold whereas for cathinone it was greater than that of amphetamine (Yanagita, 1979). In the light of these observations, therefore, khat tolerance may be possible.

As for the behavioural impact, cathinone amongst primates was found to be having a rewarding action like amphetamine (Johanson and Schuster, 1981; Woolverton and Johanson, 1984). Recently, the Advisory Council of Misuse of Drug (ACMD, 2005) has stated 'chewing khat has less reinforcing properties than other stimulants such as amphetamine and cocaine'. However, the reinforcing effects of cathinone in khat as a resemblance to amphetamine (Kalix, 1991) cannot be overlooked. This can be reflected among certain groups of khat chewers who chew khat daily (Griffiths, 1998; Patel et al., 2005; World Bank, 2007).

Additionally, tendency of chewers to secure a daily supply of khat at the expense of other needs such as food and the behaviour of khat chewers in khat market by itself suggests psychological dependence on khat (Eddy et al., 1965; Nencini and Ahmed, 1989a). The change of mood during chewing, euphoria, (Hassan et al 2002) and the depression that chewers had after khat chewing (Luqman and Danowski, 1976) was postulated as a reinforcement of khat chewing (Griffiths et al., 1997). Moreover, expression of locomotor sensitization as a sign of addictive behaviour was observed among laboratory animals after repeated intermittent oral administration of khat extract (Banjaw and Schmidt, 2005). Finally, the reinforcing effects of (-) cathinone was demonstrated amongst animal model (Schechter and McBurney, 1991).

In the literature there is currently a gap in evidence of behaviours that manifest khat dependence. Kassim and Croucher (2006) reported chewing more than two days per week was associated with khat dependence. The relationship between

the composite index of khat chewing behaviour (Appendix 9A) and khat dependence has yet to be explored.

Reflecting Gossop's proposal that khat chewing should be understood within its social context, khat chewing is socio-culturally rooted in Yemen (Drake, 1988; Kennedy, 1987). The sessions of khat chewing rules and social ethics has been described previously (Chapter 1, Section 1.2). Thus, a change in social circumstances can have a powerful effect in people's use of drugs (Gossop, 2000).

Employed UK-Yemeni khat chewers opted to chew over the weekend and the unemployed were found to be frequent chewers (Kassim and Croucher 2006). Somali khat chewers reported that their khat chewing increased in the UK compared to Somalia (Griffiths, 1998). Nabuzoka and Badhadhe (2000) reported that though there were indications that a number continued chewing khat because they became addicted to stop, most indicated that they would rather associate themselves with the traditional Somali context of khat chewing as an acceptable social activity. Kennedy (1987) suggested as well 'a drug facilitated sociability dependence' has a more powerful negative effect of 'social withdrawal symptoms' that occurred when stopping khat chewing. Therefore, the pharmaceutical impact of khat chewing within a new socio-cultural milieu, living in the UK, with an adverse social environment, leading to khat chewing dependence is possible and awaits further research.

2.3.3 Khat chewing, tobacco smoking and dependence creating substances

The literature reports that initiation of tobacco smoking associated with or mediated through an array of factors, mainly amongst them the following: genetic differences, socioeconomic status, peer pressure, cultural factors, media influences, school performance and acculturation (Chen et al., 1999).

Khat as a socio-cultural habit is often practiced in group sessions associated with the smoking of tobacco (Luqman and Danowski, 1976; Griffiths, 1998; Kassim and Croucher, 2006; Belew et al., 2000; Ayana and Mekonen, 2004; Gelaw and Haile-Amlak, 2004; Zein, 1988; Hassan et al., 2007).

Smoking is a socially learned behaviour (Fagerstrom and Schneider, 1989; Jarvis, 2004). Nencini et al (1984) observed a compulsive need to smoke among naïve khat chewers who socialised with habitual smoker chewers and Kassim and Croucher (2006) reported khat chewing initiated 12% of 75 chewers to tobacco smoking .

Khat chewing was also reported to promote heavy smoking among chewers in many locations such as UK and Yemen (Griffiths, 1998; Kassim and Croucher, 2006; Lenard and Al-Sabry, 1995). Gorsky et al (2004), in a case-control study among Jewish Yemeni, showed that smoking chewers smoke more than non-chewer smokers and the mean of cigarettes was 29.5 compared to 23.3 per day ($P< 0.03$). In line with these findings Belew et al (2000) reported that both daily and over two years of khat chewing increased the risk of heavy of smoking (OR=37.4, 95%CI=8.4-233; OR=56.21,95%CI=13.1-341 respectively). Heavy smoking was also found associated with previous khat chewing, (OR= 67.8,

95%CI=15.4-417). Heaving smoking (> 20 cigarettes per day) was reported amongst smoker chewers digagnosed with acute myocardiac infarction (Al-Motarreb et al., 2005). Therefore khat chewing, while it may be a gate way to smoking among naïve khat chewers (Kassim and Croucher, 2006; Nencini et al., 1984), may also lead to varied levels of nicotine dependence amongst current smoker chewers .

Tobacco is one of the main concomitant substances that produce significant brain stimulation when consumed together with khat. Tobacco consumption is known as an addictive substance (Stolerman and Jarvis, 1995). Therefore, progression from occasional to dependent use of the drug can be predicted (Gossop, 2003). Kassim and Croucher (2006) previously reported that severity of dependence on khat (SDS-khat) amongst khat chewers was found to correlate significantly with high nicotine dependence measured by using Fagerstrom Test for Nicotine Dependence (FTND) (Fagerstrom et al., 1990). The pathway (socio-cultural, psychosocial and behavioural factors) that may influence the relationship of FTND with SDS-khat has yet to be explored.

According to Power et al (1996), Boys et al (2000a) and Wibberley and Price (2001) cited by Boys et al (2001) users often use drugs concurrently to improve the effects of other drugs or to help manage its side effects. Reasons for mixing different drugs have been explored in many studies. Boys et al (2001), showed in a sample of 346 young poly drugs users, 44% used cannabis, 41.0% alcohol and 37.5% used amphetamine in order to improve the effects of other substances. Alem et al (1999), Ayana and Mekonen (2004) and Gelaw and Haile-Amlak (2004) reported significant association between khat chewing and smoking. However, the

reasons behind concurrent khat chewing and tobacco smoking were reported only by Gelaw and Haile-Amlak (2004). The latter reported that 71% of chewers in Ethiopia smoked to enhance khat effects. Validity of these reports has not been explored among other chewers such as the Yemeni khat chewers in the UK.

Alcohol and sedatives were reported to be used by chewers to counteract the stimulatory and insomniac effects of khat in addition to other drugs such as cocaine and ecstasy (Belew et al., 2000; Luqman and Danowski, 1976; Kebede et al., 2005; Omolo and Dhadphale, 1987; Zein, 1988; Griffiths, 1998; Nabuzoka and Badhadhe, 2000). However, empirical surveys to validate these findings have not been yet conducted.

2.3.4 Environmental and socio-economic impacts of khat chewing

Depletion of ground water for khat cultivation in original countries, unwise use of fertilisers and pesticides in khat cultivation and national food insecurity due to the replacement of the essential crops with khat, were reported as important environmental and economical impacts (Varisco, 1986; Thabet, 2002; Ben Gazi, 2002; FAO, 2008). Other socio-economic impacts of khat chewing are described in the following.

Khat chewing is often reported to be in the afternoon (Aden et al., 2006; Alem et al., 1999; Patel et al., 2005). Griffiths (1998) reported among Somali khat chewers in London that the range of hours of chewing was 3-48 per week with an average daily session of 6.8 hours. Patel et al (2005) reported that the time spent on khat chewing among Somali khat chewers in four cities in the UK as six hours with the range between 1-20 hours per day. Kassim and Croucher (2006) reported that the range of khat chewing hours among Yemeni males khat chewer residents in

Sheffield and Birmingham was between 3-36 hours weekly. In Yemen, in a sample of 4027 participants which comprised 55% and 45% male and female khat chewers respectively, 36% spent 2-4 hours per day, 35% spend 4-6 hours a day, and a 22% spend more than 6 hours a day chewing khat (World Bank, 2007). One can argue that the hours spent on chewing will be part of social interaction, in particular if it is done over the weekend. However, this time spent on khat chewing if it is multiplied by the frequency of khat chewing days during the week the impacts in term of time wasted is inevitable.

Khat chewing has been reported to impact on family food security. According to Abdul Wahab (2002), khat purchases make up a large share of the household budget in Yemen and its consumption directly affects expenditure on food. Khat and the associated use of tobacco expenditure were higher than expenditure on cereal products. Both khat and tobacco took the second place in family expenditure (Appendix 2). These findings were recently supported by proxy answers by khat chewers (68%) who would opt to pay for more food, medicine, saving and for their children's education if they were given extra funds (World Bank, 2007). Aden et al (2006) reported that khat chewing among Kenyan khat chewers represented over 50% of family budget.

Moreover, for some families the khat chewing habit leads to a cycle of indebtedness (World Bank, 2007). Fifty eight percent (58%) of 94 Somali Khat chewers in Sheffield reported that khat chewing caused them financial difficulties (Nabuzoka and Badhadhe, 2000). Among 37.6% Somali khat chewers facing difficulty in affording khat, money credit or at best would ask family member or friend to buy them khat were one of the resorts to feed their habit (Patel et al.,

2005). In Yemen comparable findings to these latter were reported among khat chewers (World Bank, 2007). Kassim and Croucher (2006) reported 25% of 75 Yemeni khat chewers in the UK were indebted due to khat chewing. The cost of khat chewing perceived by 82.6% of 161 student's khat chewers was high (Adugna et al., 1994). However, Belew et al (2000) reported that economic well being was not associated with khat chewing. The author acknowledged that the sample was weighted towards khat chewing farmers.

Furthermore, khat chewing was reported to be used among students, drivers and workers in the belief of enhancing their performance (Zein, 1988; World Bank, 2007). However, forty percent (40%) of mirra chewers in Kenya blamed khat for their low productivity and inefficiency at work and 32% associated their khat chewing with absenteeism (Aden et al., 2006). Sixty percent (60%) of female and 40% of male Yemeni khat chewers reported day-after effects (tiredness, absenteeism) of khat chewing (World Bank, 2007). Gelaw and Haile-Amlak (2004) reported among 123 khat chewers of 400 university staff 50.4% of khat chewers have one or more times missed their regular work because of chewing, and 54.5% of the chewers used to come late because of chewing khat or leave their work early to chew khat. Late wake-up time next morning (OR=10.24, 95%CI= 6.76-15.5, $p < 0.0001$), low work performance next day (OR=10.06, 95%CI= 6.42-15.77, $p<0.0001$) were reported as the subjective effects of khat chewing by 1600 Yemeni khat chewers (Hassan et al., 2002).

Ayana and Mekonen (2004) reported that khat affected the performance of university students, and there was significant association between being non chewer and higher academic performance as demonstrated by the differences in

Cumulative Grade Point Average. This finding should be investigated thoroughly. The evidence from tobacco studies showed that abstinence from tobacco alters mood and performance (al'Absi et al., 2002).

Finally, the literature suggested that khat chewing contributes to family instability, the negligence of family duties, deflation of emotional affection and ties amongst family members (Humud, 2002). Among 50 khat male chewers in Kenya, 58% reported that khat chewing caused strains on family relationships and 14 % said that khat chewing kept them away from their families (Aden et al., 2006). These findings were also supported by Patel et al (2005) and Humud (2002). In a survey among 4027 Yemenis, 29% of Yemeni women reported khat was sometimes a cause of conflict with 8 % reported that conflict arose due to the khat chewing of their partners (World Bank, 2007). This was supported by 18% of the male respondents who reported to “sometimes” have khat-related family conflicts, and just 6% reported that they often had disputes with their wives over khat chewing (World Bank, 2007).

Besides, as khat takes a high share of the family budget children may be forced to drop out from school and work (Humud, 2002). Child labour in harvesting khat was also reported (Othieno, 2009). Seeking other sources of income among chewers which might be illegal like bribes and corruption could be one of the social problems of khat chewing. This was underpinned recently by 95% of 4027 respondents surveyed in Yemen who believe that khat chewing leads to corruption (World Bank, 2007). Finally, khat was suggested to induce verbal aggression and disruptive and violent behaviour in chronic chewers (Luqman and Danowski, 1976; Odenwald et al., 2005). A random cross sectional study amongst 1294 male

college students in Awassa Ethiopia showed that khat use along with other social determinants, such as negative life events, was one of the risk factors associated with violent behaviour (Gelaye et al., 2008). Alcohol consumption and combined alcohol and khat chewing were also determinants of risk factors of gender-based violence reported in a cross sectional random sample of female college students in Awassa Ethiopia (Arnold et al., 2008).

In brief, the current literature suggested range of unfavourable health outcomes associated with khat chewing. However, none of the criteria of cause-effect propsed by Hill (1965) were established.

2.4 Summary of the literature

First, the prevalence of khat chewing showed that:

1- The range of prevalence of khat chewing in the diasporas was reported mainly, amongst the UK-Somali chewers, as between 24-67%.

2- Population studies conducted in Yemen, Somalia and Ethiopia reported the prevalence as 54%, 36.4%, 30.5% respectively.

3- In khat producing countries such as Ethiopia, there is a range in the prevalence of khat chewing (31.5-50%). This was attributed to proximity to khat cultivation areas and social backgrounds (Muslims) of populations.

4- There was significant variation in the prevalence (17.5%-64.9%) of khat chewing among homogenous younger age groups (students) such as in Ethiopia. The social backgrounds of students (Muslim) and the belief that khat chewing aided studying and improved performance with seniority in education were suggested as explanations for this variation.

5- The time frames of reporting prevalence of khat chewing varied from point prevalence to the last five years.

6- In general daily khat chewing was reported between 7.7%-44% in khat producing countries. The figures for the diasporas such as the UK were between 10% and 6%.

7- The prevalence of khat chewing amongst males, Muslims and married people is higher. The age of onset of khat chewing was suggested to be often between 10-15 years in khat producing countries.

8- In rural areas of khat producing countries there was an increase in initiation into the habit of khat chewing among chewers with family members chewing khat. Initiation into the habit of khat chewing in urban areas and non-producing khat areas like the UK was suggested through peers, friends and partner pressure.

9- A low level of completed education was suggested as higher among khat chewers in the countries where khat prevalence is high like Ethiopia. In the diasporas unemployment was suggested among frequent and older khat chewers.

Second, impacts of khat chewing on oral and general health and health risk related behaviours were as follows:

1- The literature suggested a specific role of khat chewing in oral cancer.

A White lesion in the muco-buccal site, where khat is chewed and stored, often occurs amongst chewers. This was postulated as due to the mechanical friction of khat chewing over long years as well as due to the cytotoxic effects of khat on oral mucosa cells.

2- Khat chewing was linked with cardiovascular diseases that included systolic and diastolic blood pressure and acute cardiac and cerebral infarction.

3- Impact of khat chewing on the gastrointestinal tract was also suggested.

4- The evidence of impacts of khat chewing on the genitourinary systems was conflicting. However, there is growing evidence that suggests low infant weight birth amongst khat chewing pregnant women.

5- Psychological khat dependence amongst khat chewers was suggested though the physical dependence is still debated.

6- Khat chewing was reported as an initiator for tobacco smoking and the increase in the amount of tobacco smoking during chewing khat.

7- Links of khat and nicotine dependence was also suggested.

Finally, the socio-economic impacts associated with khat chewing were suggested as time spent chewing khat, dedicating a budget for khat chewing, indebtedness, low work performance and productivity amongst chewers and contribution of khat chewing to family instability.

2.5 Gaps in the evidence

1. The prevalence of khat chewing reported has a specific community focus (Somalis), with lack of research targeting other communities chewing khat in the UK including female chewers.
2. Lack of studies amongst younger age groups chewers in Yemen.
3. The time frame of khat chewing prevalence was not well defined. Defining the time frame of khat chewing is important if it is considered as an emerging public health problem.
4. Lack of consensus in the literature on defining daily chewing (habitual, heavy and regular), numerical frequencies of khat chewing and likewise the unit (quantity) of khat chewed (bundle, wrap, marduuf).

5. Effects of khat chewing on oral health have specific diseases focus (periodontal diseases and oral cancer). Any link of khat chewing with other oral health problems such as dental caries awaits identification.
6. The impacts of khat chewing on periodontal health are inconclusive with some studies reporting khat chewing as beneficial and other as risk factor.
7. Role of khat chewing in oral cancer was confounded with other risk factors that included tobacco use and pesticides in khat.
8. The impacts of khat chewing on oral health are reported most often amongst Yemeni chewers in home land. Oral health effects of khat chewing amongst diasporas chewers' communities are still unreported in the literature.
9. Evidence of medical impacts should come from systematic review of several randomised trials alongside cross sectional and follow up studies (Sackett et al., 2007). The relationships of khat chewing with oral and general health problems were often reported from cross sectional studies that had methodological limitations. These included lack of confirmation of clinical findings, controlling for confounding factors such as tobacco and pesticides in khat, inclusion criteria of the participants and other criteria proposed by Altman (1999).
10. The studies reporting khat chewing impacts on oral and general health often suggested a 'victim blaming approach'. That is, the behaviour of frequent khat chewing was often associated with oral lesions, cardiac problems and khat dependence (Kassie et al., 2001; Ali et al., 2004; Al-Motarreb et al., 2005; Kassim and Croucher, 2006). The maintenance of frequent khat chewing that should be situated within khat chewers' socio-cultural characteristic that might influence the behaviour of chewing 'cause of the cause' and lead to

unfavourable health outcomes has yet to be established, in particular amongst UK Yemeni khat chewers.

11. Simultaneous khat chewing and tobacco smoking among chewers was reported repeatedly in the literature. However, the motive for mixing both stimulants among khat chewers has not been explored among communities chewing khat, in particular in the UK. In addition, the social context that suggested association of khat and nicotine dependence (Kassim and Croucher, 2006) needs further investigation.
12. Khat chewing psychological dependence has been explored by Grffiths (1998) and Kassim and Croucher (2006). However, khat chewing psychological dependence alongside the composite khat behaviour within its socio-cultural context needs further exploration. This then might contribute to understanding the reported unfavourable health outcomes with khat chewing.

In summary: in the light of the aforementioned gaps identified in the literature, this study proposes that the link of current khat chewing behaviour with unfavourable health outcomes might be partially explained through understanding khat chewing as a substance producing dependence that is situated within the wider social context of UK-resident Yemeni khat chewers. An additional interest is to explore further the associated khat and nicotine dependence within the wider social context of UK-residents Yemeni khat chewers.

2.6 Towards a theoretical framework

Social inequality in general and oral health is well documented (Marmot, 2003; Watt and Sheiham, 1999). Different mechanisms have been suggested in explaining these inequalities. These included material deprivation, psychosocial factors, individual cultural/lifestyle and early life course factors (Marmot and

Wilkinson, 2006; Sisson, 2007; Kuh et al., 2003). The link between these three former mentioned mechanisms is plausible. Individuals of low social status may have poor psychosocial factors such as negative life events and less social support that may lead to stress induced damage, and lead directly to ill health or indirectly influence health damage behaviour, such as frequent khat chewing. The early life course approach studies the long term effects on later health or disease risk of physical and social exposure during gestation, childhood, adolescence, young childhood and later adult life (Kuh et al., 2003). In the following section potential relevant mechanisms (material deprivation, psychosocial factors, individual cultural/lifestyle) to the study are discussed

2.6.1 Material deprivation

With respect of material conditions and health, most often poorer socio-economic circumstances lead to poor health (Galobardes et al., 2007; Marmot and Wilkinson, 2006). Different indicators of socio-economic position (SEP), which often correlate, have been proposed in the literature. The use of these indicators and the mechanism by which they correlate with health outcomes has been explained by Galobardes et al (2006b). According to Galobardes et al (2007), each socio-economic indicator will emphasise a particular aspect of social stratification which may be more or less relevant to different health outcomes. In this section potential SEP indicators relevant to the study are discussed.

Area based level indicators are used to characterise area on a continuum from deprived to wealthy as well as a aproxy for socio-economic position (SEP) of people living in it (Galobardes et al., 2006a). The current consensus that the effect of disadvantaged neighbourhood has a significant impact on health outcomes and health related behaviours such as self rated health and physical activity,

irrespective of individual characteristics, is fairly consistent (Santos et al., 2007; Yen et el.,1998). Area influences health through the lack of health services such as selling food at affordable prices and the prevalence of prevailing attitudes towards health and health related behaviour, stress and lack of social support (Pickett and Pearl, 2001).

Residents of socio-economically disadvantaged and segregated neighbourhoods were significantly more likely to assess their oral health as fair or poor, to report greater tooth loss, poor self-rated health, poor mental health and an increase in prevalence of injection drug use (Turrell et al., 2007; Reijneveld, 2002; Stafford et al., 2008; Cooper et al., 2007).

Duncan et al (1999) found that smoking behaviour was influenced independently by living in a poor neighbourhood. Shohaimi et al (2004) among 22,562 men and women aged 39-79 years, assessed fruit and vegetable intake using a food frequency questionnaire showed that being in a manual occupational social class, having no educational qualifications, and living in a deprived area all independently predicted significantly lower consumption of fruit and vegetables.

Housing conditions and tenure measure material aspects of socioeconomic circumstances (Galobardes et al., 2006b). Poor housing impacts on health through its hard conditions such as dampness, heating, the availability of area services and quality of built environment whilst soft conditions include perceptions of social status, home security and area culture and behaviours (Shaw, 2004).

Living in overcrowded homes during childhood may have immediate impacts, e.g. traumatic dental injuries as well as later in life poor mental health and heart disease (Marcenes and Murray, 2001; Bashir, 2002). Overcrowded housing was also found to predict self-rated health as poor amongst men (Dunn et al., 2004). Windle et al (2006) and Schootman et al (2007) reported poor housing conditions such as coldness and lack of cleanliness as an independent contributor to the risk of self-reported health status and self-reported diabetes in elderly Welish and urban middle-aged African Americans. Finally, housing tenure (rented) contributed to depression and tobacco smoking (Ellaway and Macintyre, 1998; Lim et al., 2010).

Knowledge and skills attained through education may affect a person's cognitive functioning making them more receptive to health education messages or more able to communicate with and access appropriate health services (Galobardes et al., 2006b). According to Daoud et al (2009) the level of completed education translates into adult job opportunities, ultimately expressed as income level, standard of living and quality of life and health. Paulander et al (2003) showed that in all age groups (aged 35,50,65,75 years), individuals with a low level of education had fewer intact tooth surfaces and significantly poorer occlusal functioning. Locker and Leake (1993) reported that low level of education was the only indicator of SEP that predicted periodontal disease amongst elderly Canadian. The American National Health Interview Survey for 1989 reported that tooth pain was more common amongst individuals with a low level of education (0-10 years) (Vargas et al., 2000). Tsakos et al (2009) reported that low educational level has an independent negative impact on oral health related quality of life (OHRQoL) in older people.

Low income and low education attainment were reported as risk factors for periodontitis amongst elderly Mexicans (Borges-Yanez et al., 2006). Higher educational attainment was associated as well with the utilization of dental services (Ohi et al., 2009; Mumcu et al., 2004). Low level of education and gradients in education was important predictor of alcohol-related mortality in Estonia and self perceived general health (Rahu et al., 2009; Sabbah et al., 2007).

The role of unemployment in ill health and mortality has been reviewed by Bartley (1994). The mechanisms by which unemployment can affect health included relative poverty, social isolation and health damaging behaviour. The link of unemployment mediated with financial difficulties was found to be associated with psychological distress (Thomas et al., 2007). The role of material conditions and having private dental insurance in oral health inequality was reported as important factors in the US. Stancil et al (2005) reported that having private dental insurance was associated with better clinical oral health status. Employment characteristics determine adult socioeconomic status beyond economic livelihood. A person's occupation is important for socialization and participation in networks beyond primary group (Marmot et al., 2006).

Social isolation was found to modify the effect of unemployment on psychosis (Reininghaus et al., 2008). Lovell (2002) suggested a role for employment in accessing broadly valued social life that encourage responsible use of drugs or become a stake in responsible use as opposed to facilitating risky drug use behaviour. A link of unemployment with smoking was reported (Waldron and Lye, 1989; Lee et al., 1991).

The literature also reports the importance of different aspects of employment status with health outcomes. Ferrie et al (2002) reported the effects of chronic job insecurity and change in job on self-reported health, minor psychiatric morbidity, physiological measures, and health related behaviours. People having employment insecurity, and working in unfavourable work conditions such as loss of employment autonomy and being more highly supervised at work were found to be associated with an increased risk of illnesses (Bartley et al., 2004; Lindstrom, 2005). Kaleta et al (2008) reported low self-rated health amongst unemployed men and amongst unemployed women. In Brazil, low self-rated health was reported amongst male unemployed (Szwarcwald et al., 2005). In Sweden, during the period of 1992-1997 when the unemployment was high the self rating health as poor was higher than it was in the 1980s (Ahs and Westerling, 2006). The English Census for 2001 reported that the rate of poor health was higher amongst unemployed (Popham and Bambra, 2010).

Unemployment was also associated with self-reported health conditions that included Type 2 diabetes, psychiatric morbidity and bad psychological health (Yang et al., 2009; Ferrie et al., 2002; Lindstrom, 2004). In addition, according to Graetz (1993), the results showed that employed people report significantly lower levels of health disorder than students and the unemployed. Amongst the Serbian population self-reported arthritis was more likely found amongst both sexes of poorest groups (Vukovic et al., 2008). Finally, in a German National Telephone Survey, asthma was linked with being unemployed amongst respondents aged 18 years and above (Hoffmann, 2007).

In brief, one can propose that there is a role for material conditions in relation to khat chewers' general and oral health that await identification.

2.6.2 Psychosocial factors

As for the role of psychosocial characteristics in relationship with health, protective psychosocial resources that buffer the adverse effects of SEP include optimism, coping style, a sense of mastery or personal control, and social support and adverse psychosocial include loss of control, negative life events and helplessness and low self esteem (Taylor and Seeman, 1999).

The mechanism by which psychosocial factors impacts on health was postulated directly through the 'allostatic load', stress induced damage (McEwen, 1998). The ability to successfully adapt to challenges has been referred as allostasis and when the adaptive responses to challenge lie chronically outside of normal operating ranges, wear and tear on regulatory systems occurs and allostatic load accumulates (Seeman et al., 2001). Allostatic load links physical disease such as heart problems through the neuroendocrine pathways. A stress response initiates the sympatho–adrenal pathway and hypothalamic pituitary–adrenal axis (HPA), which results in increase of sympathetic tone and release of hormones including cortisol and corticoids that are desirable during emergency. However, chronic activation of these pathways has determinant effects on health (Brunner and Marmot, 2006). Indirect effects of psychosocial effects was postulated through an increase in health risk behaviours such as smoking (Elstad, 1998).

Adverse psychosocial factors such as negative life events were reported to be associated with periodontal disease (Croucher et al., 1997; Genco et al., 1998; Green et al., 1986). Social support, one of the aspects of social capital, is beneficial to health and social isolation leads to ill health (Putnam, 2004; Stansfeld, 2006). Social support definition varies in literature (Pahl, 2003).

Networks, social participation and social ties through marital status are reported as aspects of social support (Barrera., 1986).

Lack of social participation after cardiac surgery amongst elderly was reported as a risk factor for death (Oxman et al., 1995). The literature reported the important role of high social participation amongst high SES in enhancing health related behaviour (leisure time physical activity, cessation of smoking (Lindstrom et al., 2001; Lindstrom et al., 2000). Low social participation and trust were found to be associated with self-rated health as bad and self-reported bad psychological health (Lindstrom, 2004). Veenstra (2000) reported the importance of attendance at religious services and participation in clubs for self-rated health amongst elderly. Amongst equal socioeconomic circumstances in Sweden, self-rated health was explained by differences in social participation (Hyyppa and Maki, 2001).

The role of social participation was also associated with tobacco cessation (Lindstrom et al., 2000) and the role of psychosocial factors such as loss control and isolation were found as mediators between unemployment and smoking (De Vogli and Santinello, 2005). According to Lundborg (2005), social capital reduces unhealthy habits like smoking and excessive alcohol consumption or other deviant health behaviours. However, if social capital is a scarce resource substance use may function as an alternative coping behaviour in the presence of stress since it is perceived to produce relaxation. An individual's large network is an indicator of being monitored and controlled, in contrast, to individuals with small or no social network. Different aspects of social relations that include social capital, network and participation in associations were reported to be associated with self-rated health (Kawachi, 1999; Melchior et al., 2003; Molarius et al., 2007). Finally, social

support interventions through health visitors reported positive findings in relationship to increased fruit and vegetable consumption amongst disadvantaged adult populations in the US (Del Tredici 1989; Buller 1999).

The link of psychosocial resources with SEP was postulated as that individuals with low social status report more environment challenges and less psychosocial resources such as coping ability and internal locus of control (Taylor and Seeman, 1999). Sanders et al (2007) reported that coping was inversely associated with retention of teeth. Defensive coping style was found as a risk factor for sever periodontal disease (Wimmer et al., 2002). There is also a considerable evidence from population-based and clinical studies for the association between psychosocial adversity and drug addiction vulnerability (Sinha, 2008). The well known mechanism by which psychosocial characteristics can be linked to SEP and health is explained through the effort-reward imbalance model (Siegrist, 1996; Rugulies et al., 2009; Siegrist and Marmot, 2004) and demand–control model (Karasek, 1979; Kuper and Marmot, 2003).

Adverse SEP of khat chewers may be associated with adverse psychosocial resources that include khat dependence and other factors such as negative life events and lack of social support and coping resources which has direct impact on health or through frequent khat chewing.

2.6.3 Individual cultural/lifestyle factors

Common risk behavioural factors (Sheiham and Watt, 2000) including smoking, betel quid chewing, oral hygiene and risk taking behaviours were found to be associated with periodontal disease, tooth loss and traumatic dental injuries (Hujoel et al., 2003; Akhter et al., 2008; Naidoo et al., 2009). These factors, lack of

exercise and tobacco smoking, was found to be as well associated with subjective self-reported poor health, psychological well being and cardiovascular disease (Ransford and Palisi, 1996; Gordon et al., 2008; Wolf et al., 1988).

Models such as Health Belief model and The Theory of Reasoned Action, that are beyond the scope of this study, were suggested to explain behaviour and behaviour change (Rosenstock et al., 1988; Ajzen, 2005). However, lifestyle is not freely chosen but dependent on structural and psychosocial factors (Stronks et al., 1996). Lantz et al (2001) reported the relationship between lifestyle factors and SEP differences in health is moderate, explaining about 25% of the variance in scores of SES differences in health outcomes.

Lynch (1997) reported a higher prevalence of risky health behaviours amongst individuals with low levels of education and income. In ten years prospective cohort study of civil servants followed up for 10 years after baseline data the SEP remain statistically significant after controlling for health related behaviours such as smoking. Health related behaviours were not found to be sufficient explanations for SEP inequality in health (Smith et al., 1990).

In a nationally representative sample of 3617 adult women and men participating in the Americans' Changing Lives survey, after considering the health risk behaviours (smoking, alcohol, physical activity) the risk of dying was still significantly elevated for the lowest income group (OR= 2.77,95% CI 1.74-4.42) and this was followed by the middle income group (OR= 2.14 95%CI 1.38-3.25) (Lantz et al., 1998)

According to Sabbah et al (2009) unfavourable health related behaviours tend to cluster in the same individual and are more prevalent in those of lower social hierarchical statuses. In a representative sample of the US population Sabbah et al (2009) found that improvement in health related behaviours, such as a visit to the dentist and smoking lessened the effects of socioeconomic disparities for oral health but even after taking into account a number of confounders such as age and ethnicity it did not eliminate socio-economic disparities in clinical and subjective oral health. The study implied complex factors such as work related stress and control at work, which operated beyond the individuals' capacity.

The importance of material rather than behavioural factors has even been demonstrated in ethnicity studies and amongst different populations. Reid et al (2004), reported that material factors were the main determinants of dental caries when comparing Hispanic and non-Hispanic blacks and Mexican-Americans with non-Hispanic whites. Behavioural factors were reported as having no effect on dental caries among different ethnicities and did not mediate the relationship between material factors and dental caries. Sanders et al (2006) investigated the extent to which social inequalities in oral health among Australian adults could be explained by the behaviours of dental attendance and dental self care. The results showed that the behaviours accounted for little, if any, of the socioeconomic gradient in oral health, particularly tooth loss.

An alternative model focusing on the influence of culture determining behavioural choices has also challenged the traditional model of behaviour. It suggested that behaviours are not freely chosen but influenced by the culture norms of behaviour (Sisson, 2007). Bourdieu (1986) stated that social groups use lifestyle as a way of

displaying their membership of different social groups. The role of a social/culture perspective on behavioural decision-making is still absent from the health inequalities literature (Sisson 2007).

There have been debates on the definition of acculturation. According to Berry (2005) ‘Acculturation is the dual process of cultural and psychological change that takes place as a result of contact between two or more cultural groups and their individual members’. According to Cruz et al (2004) acculturation is a complex phenomenon that can serve as a proxy for cultural norms and behaviours affecting care-seeking, prevention behaviour and ultimately health outcomes. Acculturation could be a risk (Chen et al., 1999) to oral health due to adopting negative behavioural practices such as cariogenic diets and alcohol consumption and smoking (Cruz et al., 2004; Otero-Sabogal et al., 1995) or a protective factor (Cheng et al., 2007) such as benefiting from preventive services (Cruz et al., 2004).

Litman (1986) proposed that the less acculturated the community in the host community the more attached is to its culture. This may be the case for khat chewing amongst the diasporas communities in particular the Yemeni community in the UK. Khat chewing in Yemen has a dominant role in celebrations, marriages and other aspects of Yemeni life (Kennedy, 1987). Patterns of khat chewing are controlled by culture checks and etiquette (Anderson, 2007), which is defined as ‘High culture’ (Odenwald, 2009a). As previously stated (Chapter 1, Section 1.2), in Yemen, the institution of khat chewing occurs daily in both rural and urban areas. Generally khat leaves are chewed in the afternoon after work is finished (Varisco, 1986). The influences of different aspects of acculturation in particular language

spoken, years of residency in the UK and place of birth and first place of initiation of khat chewing and smoking has not received attention. In the absence of the data, relevant literature can be referred to.

Lengthier periods of residency in host countries was found to be associated with increased risk factors of obesity and diabetics (Kaplan et al., 2004; Jaber et al., 2003). In both gender amongst Latino(a)s a high level of acculturation as measured by length of stay in the USA, found associated with a two fold higher likelihood of consuming moderate to high alcohol amounts (Abraido-Lanza et al., 2005).

Speaking a language other than English at home identified Hispanics at risk of not receiving recommended and important health preventive services (Cheng et al., 2007; Woloshin et al., 1997). Amongst Turkes living in Germany, regular use of dental services was found to be linked to a better level of German language and use of German service (Ugur and Gaengler, 2002). Nabuzoka and Badhadhe (2000) proposed that language barriers amongst Somali khat chewers in the UK was found to be linked to increase of khat consumption.

More acculturated Hispanics, measured by a language competency scale, were associated with better self-reported measures of general health (Atchison et al., 1998). A second study of Hispanic immigrants, utilizing a similar language-based scale, showed that acculturation had a direct association with the oral health status index (OHSI) (Spolsky et al., 2000). Arabic–speaking emigrants in the US were found more likely to self-report poor health compared to both US-born Arab Americans and English speaking emigrants (Abdulrahim and Baker, 2009).

Finally, relationships of non-modifiable demographic variables such as age; family size, marital status and gender with khat chewers' health outcome have yet to be explored.

To sum up, in the light of the aforementioned literature (Chapter 2, Section 2.6), studies aiming to explore the socio-cultural and psychosocial characteristics of khat chewers are sparse in the current literature. Importantly, the relationship between socio-cultural, psychosocial pathways and behavioural (composite khat behaviour, tobacco smoking, pattern of dental attendance) characteristics of khat chewers with health outcomes (self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence) are still absent in the literature, in particular amongst UK Yemeni khat chewers.

2.7 Overview of health outcomes investigated in this study

First, self rated health has been identified as an important indicator of the multi–dimensional construct, health (Cott et al., 1999). Individual self rated health represents a summary statement concerning the way in which various aspects of health subjective as well as objective are combined within their perceptual framework (Kaplan et al., 2003). The evaluation of health or subjective health (SH) is considered a legitimate indicator of overall health status, providing a valid reliable and cost effective means of health assessment particularly in studies in which other forms of health information are lacking, where questionnaire resources are limited and it is often used as a proxy measure of disease risk instead of more formal, but both invasive and costly, measures of physiological parameters (Kaplan et al., 2003; Locker et al 2009; Adams and White 2006). A single global item 'How would you describe your current health state in general?', with five

possible response categories were given: very good, good, fair, bad or very bad. This question is the most frequently used subjective measure of health (Bobak et al., 2000). It has been validated as a surrogate for objective health outcomes such as haemoglobin level and blood pressure (Jylha et al., 2006), as a strong predictor of future morbidity and mortality (Kaplan and Camacho, 1983; Idler and Angel, 1990) and health behaviour (Idler et al., 1997). Determinants of self rated health were reported and these include age (Kawada et al., 2009; Kelleher et al., 2003; Alexopoulos et al.,2009; Molarius et al., 2007; Becue-Bertaut et al., 2008; McFadden et al.,2008), social position (Szwarcwald et al., 2005; Kelleher et al., 2003; Popham and Bambra, 2009; Molarius et al., 2007) and social support (social network and social participation) (Lindstrom, 2004; Molarius et al (2007; Veenstra 2000; Nicholson et al., 2009; Kawachi, 1999; Melchior et al., 2003; Molarius et al., 2007). Determinants of self-rated 'compromised' health in the Yemeni diasporas' khat chewers has not been explored in the current literature.

Second, as for self report health condition (s), Dalstra et al (2005) suggested that interview based studies should not exclusively focus on generic health indicators such as general self assessed health, but give ample attention to the prevalence of specific diseases and their determinants. Therefore, the current research has refocused on morbidity and disease-specific measures, for which socioeconomic are largest (Dalstra et al., 2005; Schaufelberger and Rosengren, 2007). Self reported health condition (s) were found reliable and valid when compared with physician-reported medical histories (Dalstra et al., 2005; Schaufelberger and Rosengren, 2007) including cardiac diseases (Goldman et al, 2003; Kriegsman et al, 1996) cancer (Schrijvers et al, 1994) and diabetes (Goldman et al, 2003). Determinants of self-reported health conditions were reported in the literature that

includes, age and unemployment (Millar and Young, 2003; Martin et al., 2008; Ferrie et al., 2002; Graetz., 1993). Yet identification of determinants of self reported health conditions in the Yemeni diasporas' khat chewers awaits identification.

Third, self reported oral health problem (s) such as periodontal diseases as alternative to the primary collection of clinical data has been reported in the current literature (Tomar, 2007). This approach has been appraised as less time consuming, less expensive, consistent and complete, accessing a more representative sample including respondents who don't access care or don't have insurance. Amongst Ethiopian emigrant minorities 75% of the subjects clinically diagnosed with periodontal pockets self perceived a 'bad' health status of gum (Zini et al., 2009). Locker (2005) reported the prevalence of dental trauma based on children's self-report was 17.2% compared to 17.8% based on clinical examination. Self reported dental and oral injuries was reported as 15.5% and was more prevalent amongst individual with lower education attainment (Locker et al., 2007). Of 75 khat chewers interviewed by Kassim and Croucher (2006) 55% self-reported oral problems. Obtaining a preliminary estimate of self report oral problem (s) with its determinants amongst a fairly large sample of UK-Yemeni adult male khat chewers has not been undertaken.

Finally, with respect to nicotine dependence, nicotine the principal alkaloid in tobacco products is generally accepted to be the active pharmacological agent responsible for CNS effects that maintain tobacco use (Crooks and Dwoskin., 1997). Tobaccos products use whether smoked or smokeless have well documented impacts on oral and general health (Warnakulasuriya et al 2010;

Bartecchi et al., 1994; Kamholz, 2006). A range of nicotine dependence determinants were reported in the literature that includes socio-demographic characteristics (Rahu et al., 2009; Chenet et al., 1998; Koskinen et al., 2007; Croucher et al., 2007; Buchanan et al., 2004, Jarvis and Wardle., 2006). Various measures were used to measure nicotine dependence amongst tobacco users that includes the Nicotine Dependence Syndrome Scale (NDSS) (Shiffman and Sayette., 2005; Shiffman et al., 2004), the Fagerstrom Test of Nicotine Dependence (FTND) (Heatherton et al., 1991) and the Boyle et al (1995) Scale for Measuring Smokeless Tobacco Dependence.

FTND is a well known paper and pencil test of nicotine dependence. This test has been found a fairly reliable and valid scale for nicotine dependence amongst cigarette and smokeless tobacco users in other cultures, albeit it was recommended to be revised to cross–cultural differences (Huang et al., 2006; uysal et al., 2005; Croucher et al., 2002). Dependence in cigarette smokers can be measured objectively by measuring different biomarkers. Cotinine in plasma, saliva and urine is a metabolite of nicotine and a standard marker of nicotine exposure. In addition, carbon monoxide measured as blood carboxyhaemglobin and expired carbon monoxide, provides an acceptable degree of discriminating smokers from non-smokers and it is considerably cheaper and simpler to apply (Jarvis et al., 1987).

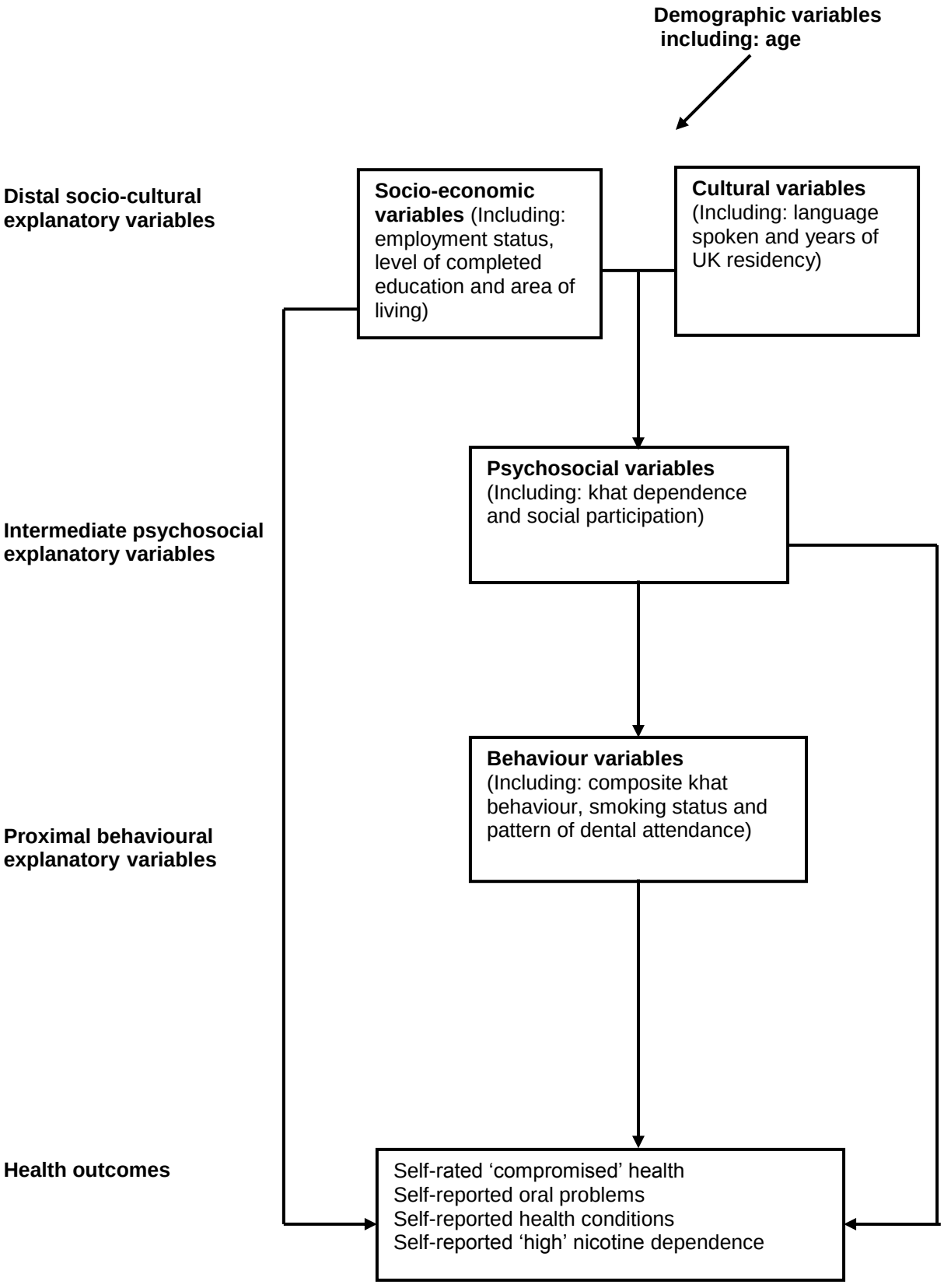
The current literature has reported nicotine and khat dependence association amongst UK-Yemeni khat chewer cigarette smokers (Kassim and Croucher, 2006). Within the context of Yemeni khat chewers it may be proposed that khat chewing could predict nicotine dependence. The bulk of the literature, though

cross sectional, supports this proposal (Chapter 2, Section 2.3.3). This does not precludes an alternative relationship (nicotine dependence predicts khat chewing). Dependence on concurrent substances has been acknowledged in the literature such as alcohol and nicotine dependence (Gulliver et al., 1995). Prospective studies could support or not this proposal. The theoretical model in Chapter 2, Section 2.8 proposes a relationship between khat chewing and nicotine dependence which would be explored within the social context that linking nicotine and khat dependence.

2.8 Theoretical framework

The study framework proposed (Figure 2.1) is based on a well recognized model of health inequality (Brunner and Marmot, 2006). This postulates that socio-cultural (distal), psychosocial (intermediate) and behavioural (proximal) factors may contribute to explain health outcomes (self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence) in khat chewers. Socio-cultural factors may operate directly on health or indirectly through psychosocial and behavioural factors. Psychosocial factors may also operate on health independent of socio-economic position of chewers or through behavioural factors.

Figure 2.1: Study theortical framework, an holistic approach



2.9 Aims:

The main aims of this study are: 1) To identify the characteristics of a sample of Yemeni Khat chewers in Sheffield. 2) To investigate how these characteristics are associated with:

a) Self-rated 'compromised' health

b) Self-reported oral health problems

c) Self-reported health conditions

d) Self-reported 'high' nicotine dependence.

2.10 Objectives

- To establish baseline information for respondents including socio-culture factors.
- To further explore khat dependence using Severity of Dependence Scale (SDS-Khat).
- To identify self-report of khat dependence assessed with pharmacological biomarkers, namely, cathinone.
- To validate Severity of Dependence Scale (SDS-khat) through psychometric, pharmacological biomarkers analyses and correlation with composite index of khat chewing behaviour.
- To establish baseline information for khat chewers' psychosocial factors measured by khat dependence scale and social participation index.
- To establish baseline information for khat chewers' behaviours indexed by composite khat chewing behaviour and pattern of dental attendance.
- To establish baseline information for tobacco smoking and level of nicotine dependence validated with objective scores, carbon monoxide (CO).
- To explore whether there is any correlation between socio-culture, psychosocial, behaviour factors (composite khat behaviour, dental

attendance and smoking tobacco) and health outcomes (self-rated 'compromised' health, self-reported oral problems, self-reported health conditions.

- To explore the correlations between socio-culture, psychosocial, behaviour factors (khat chewing) and self-reported 'high' nicotine dependence.

2.11 Hypotheses

- Respondents of low socioeconomic position, as measured by low level of completed education, being unemployed, living in crowded housing, not owning their homes, living in deprived areas are more likely to self-rate 'compromised' health, to self-report oral problems, to self-report health conditions and to self-report 'high' nicotine dependence
- Less acculturated respondents as measured by language proficiency, place of birth, period of UK residency and place of starting khat and tobacco smoking are more likely to self-rate 'compromised' health, to self-report oral problems, to self-report health conditions and to self-report 'high' nicotine dependence.
- Khat dependent respondents as measured with Severity of Dependence Scale (SDS-khat) are more likely to self-rate 'compromised' health, to self-report oral problems, to self-report health conditions and self-report 'high' nicotine dependence.
- Respondents with low social participation as indexed by social participation are more likely to self-rate 'compromised' health, to self-report oral problems, to self-report health conditions and to self-report 'high' nicotine dependence.
- Respondents with high composite index of khat chewing behaviour are more likely to self-rate 'compromised' health, to self-report oral problems, to self-report health conditions and to self-report 'high' nicotine dependence.

- Respondent attending dentist when in pain are more likely to self-report oral problems.
- Respondents reporting smoking behaviour are more likely to self-rate ‘compromised’ health, to self-report oral problems and to self-report health conditions.

Chapter 3. Methodology

3.1 Introduction

The methods used to address the aims and objectives of this current study are described in this chapter.

3.2 Design and setting of the study

This cross-sectional study recruited male khat chewers age 18 years or above, from Sheffield Yemeni community. This area was chosen on the basis that it has a large geographically circumscribed Yemeni community with a population estimate available (Sheffield Hallam University, 2003). In addition, an exploratory study of khat chewing among this community (Kassim and Croucher, 2006) (Appendix 12) had been previously carried out.

3.3 Ethical approval and confidentiality

Prior to the pilot and main study the protocol of the study was reviewed and approval No 05/Q06034/194 was granted from East London and City Health Authority (ELCHA) Research Ethics Committee in January 2006 (Appendix 3A). Approval for saliva collection was also later obtained in January 2007 (Appendix 3B). In both pilot and main study the heads of the Yemeni community were contacted, informed and were asked for their consent to carry out the study amongst their community khat chewers. They showed high cooperation, as they perceived that the study was vital to establish the community's khat chewing behaviour. They informed khat chewers and khat sellers about the study.

Written informed consent in both English and Arabic for both main interview and saliva sample were obtained from the participants (Appendix 4A, 4B, 4C, 4D).

Participants were assigned a code number and the data were kept in a secure locker in the Department of Dental Public Health, Institute of Dentistry, Barts and The London, School of Medicine and Dentistry, Turner Street, London E1 2 AD. Confidentiality of the information obtained was assured and only the researcher (SS) and the principal investigator (RC) shared this information for research purposes.

3.4 Identifying the prevalence of khat chewing and sample size estimation

A systematic search of the literature reporting the prevalence of khat chewing was conducted. This was carried out to identify and assess the studies reported the prevalence of khat chewing worldwide and to help estimate the sample size for this current study.

3.4.1 Search strategy for literature of khat chewing prevalence

Studies reporting the prevalence of khat chewing were retrieved from articles in the PubMed, Web of Knowledge, Psyc INFO databases and citations tracking as follows:

- At the beginning of the search, in order to get wider results, the search of the PubMed was not set with any limits. The terms (catha OR miraa OR qat OR khat) were first used for retrieving the articles.
- These terms were then combined with relevant methodological filters for study designs (prevalence OR cross sectional OR survey OR descriptive). The subject search strategy (catha OR miraa OR qat OR khat) AND (prevalence OR cross sectional OR survey OR descriptive) was used for identifying relevant articles. This strategy was adapted as well to search the other databases.

- Citation tracing (backward and forward) through studies that were considered of potential for this review was also conducted (Appendix 5A).

Thereafter, studies were included and excluded according to the criteria described below.

The inclusion criteria were as follows:

- Language of publication: English language studies only were included.
- Types of studies: cross sectional studies were only included as they are the classical method of reporting prevalence (Hennekens and Buring, 1987).
- Types of participants: both sexes of any age groups, in any population of khat chewers and in any location, were the interest of the review.
- Exposure of interest: khat chewing.
- The frequency and time frames (current, ever) of khat chewing: these were not set as prerequisites.
- Outcome measures: the review aimed to identify the prevalence of khat chewing. Therefore, studies that reported the prevalence of khat chewing or studies from which the prevalence can be calculated were included.

Exclusion criteria were:

- Technical reports, case study reports and papers that did not contain the original data (reviews).
- Abstracts and unpublished studies and articles related to other aspects of khat chewing as pharmacological studies.

According to the above inclusion and exclusion criteria, the results of the search are described as follows:

The initial databases search identified 117 studies (Appendix 5A). The title and the abstracts were first screened. Thirty-four studies were considered for inclusion. Included texts were read thoroughly and selected if they met the inclusion criteria. Two studies were excluded and 32 studies were entered into this review. Citation tracing added a further twelve studies. Though with varied aims, the total of cross sectional studies addressing prevalence that were selected for review and assessment was forty-four.

For this study, the review data extraction sheet for pooling the relevant information from studies reporting khat prevalence was adapted from Pau et al (2003). Results were grouped into country of study, source of the sample, population type, sample size, age, sex, time frame of khat chewing prevalence reported and overall prevalence and prevalence by age and gender (Chapter 2, Section 2.2, Table 2.1,2.2,2.3,2.4). A recognized assessment checklist (Altman, 1999) of medical articles was used to appraise these studies. The assessment checklist of papers consisted of eight questions, concerning study design, sample selection, instrument data collection validity and reliability and statistical analysis of data (Appendix 5B). Assessment was conducted to highlight the strengths and weaknesses, through answering the question ‘Yes’ or ‘No’ or ‘Not clear’, and to draw relevant conclusion about studies reporting khat-chewing prevalence. The assessment of these studies is presented in the literature review (Chapter 2, Section 2.2.5).

3.4.2 Sample size estimation

Identifying a sample size for this study was problematic. There is no current study of khat chewing prevalence amongst the UK-resident Yemeni community. Therefore, this current study sample estimation was based on an available

prevalence estimate (24%) of khat chewing identified in the literature review amongst Somalis in the UK, (Bhui et al 2003). This prevalence was considered to be a robust estimate because of sampling procedure.

- The Yemeni community average size was estimated by Sheffield Hallam University (2003) as 4224.
- Thirty eight percent (38%) were 19 years and older, which accounted for 1605 subjects.
- Of 1605 subjects, women accounted for 47% and men 53%
- Number of men aged 19 years and older = 1605 × 53%= 851

Therefore, the sample size required for this study was estimated as 204. This calculation, using Epi-Info version 3.5, was based on prevalence = 0.24 and a 95% confidence interval. This sample is small but considered to potentially recruit all Yemeni adult male khat chewers in Sheffield.

The probability or random sampling which is the epidemiological gold standard that gives each member of the population the same chance of being selected (Dunn and Ferri, 1999), was not followed. Instead the sample for this study was drawn from places of khat sales. The rationale for using this approach that was informed by Ribeiro et al (2004), was as follow:

1. Lack of the list needed (electorate, housing or medical) to conduct selection. Sampling for the Yemeni community was shown to be difficult due to the dearth of information from official statistics (Sheffield Hallam University, 2003). Privilege access interviewers (PAI) have been used among Somali khat chewers (Patel et al., 2005; Griffiths, 1998)

2. Taylor and Griffiths (2005) proposed that in defining a drug using population, their physical and geographical sample point and, if necessary, a pre-specified time should be used instead of having a prior exhaustive sampling frame.
3. According to Topp & Mattick (1997) and Morgenstern et al (1994), the selection of a sample for psychoactive substance users from treatment centres proved more dependable than a sample recruited opportunistically from the street and community.

3.5 Training and adaptation of main interview questionnaire

The researcher attended a module covering both methods of qualitative and quantitative data collection during her Masters in Dental Public Health programme (2002-2003). In this module the student was trained how to conduct face to face interviews. These skills were used during the exploratory study that assessed khat chewing amongst Yemeni community in Birmingham and Sheffield (Kassim and Croucher, 2006) (Appendix 12).

Adaptation of sections of the screening interview questionnaire and the main interview questionnaires (Appendix 6A, 6B, 6C, 6D) was carried out before the pilot study and the researcher followed the process of adaptation that was proposed by Hunt et al (2004). Four bilingual Yemeni khat chewers forward translated the English version of the questionnaire. Monolingual khat chewers (Arabic speakers) in Sheffield were consulted during this process and field-testing was conducted. This then followed with back translated from Arabic to English. The researcher along with one Yemeni medical professional reviewed the translations (the professional was fully aware of khat culture among Yemeni community).

3.6 Pilot Study

A presentation of the findings of the exploratory study (Kassim and Croucher, 2006) (Appendix 12) had taken place on the 14th February and 25th of February 2006 in both areas of Birmingham and Sheffield. This was followed with discussion with khat chewers and community leaders. A pilot study followed the presentations in both areas. The main interview questionnaire (structured schedule interview questionnaire) was first pre-piloted on ten volunteer Yemeni khat chewers in London and then piloted on a purposive sample of two volunteer groups of Yemeni khat chewers from Birmingham (8 khat chewers) and Sheffield (12 khat chewers). These latter were not included in the main study. The chewers were offered the opportunity of responding in either Arabic or English.

This study took place against a background of media speculation and stereotyping. Patel et al (2005) reported that khat chewing among Somali, in the UK has been raised in media reports in a way that stigmatised the communities using it. Some chewers expressed specific concerns about this research, as it coincided with the Home Office review which was considering a ban of khat (ACMD, 2005). This in return affected the confidence and the willingness of many khat chewers to participate. Thus, the researcher had to assure the chewers always that this study was mainly of academic interest and to inform policy development. Awareness of the researcher of khat culture alongside the collaboration of heads and gatekeepers of the community in Sheffield with the researcher proved crucial in recruiting khat chewers. The time of the interview with saliva and carbon monoxide collection took between 30-45 minutes.

The following amendments for both English and Arabic questionnaires pilot studies were adopted:

- The word Takzeen was used in bracket beside the word of chew in the English screening and main interview questionnaire (Appendix 6A, 7C). This is because the word chewing is not an appropriate one, khat leaves are not only chewed but chewed and stored-Takzeen is the equivalent Arabic meaning to store in the muco-buccal side (Ali, 2005).
- During the process of piloting the severity of dependence scale, the chewers responded to the question, in the last 12 months, *'How did you find it to stop or go without chewing?'* (Appendix 6C, 6D, Section 5, Q5) as not applicable to them since they had not stopped or gone without chewing. The developer of the scale (Gossop et al., 1995) recommended replacing it with the hypothetical question *'How would you find it to stop or go without khat chewing ?'*.
- The question 'Why do you smoke when you chew khat?' and 'Which initiate your smoking?' was added to the questionnaire in the section of the regular tobacco use and tobacco use with khat only. These questions were established from Kassim and Croucher (2006) who observed that chewing khat appeared to initiate tobacco smoking. 'Do you smoke more at the beginning of the khat session?' was also added to the questionnaire in the section of the regular tobacco use and tobacco use with khat only. This was in order to explore both behaviours (khat chewing and tobacco smoking) among different chewers with differing patterns of khat chewing and tobacco smoking. 'Have you ever tried to stop smoking with khat chewing', was added in the section of tobacco use with khat only and the number of

times cessation was attempted was asked as well in order to explore khat initiation of smoking and the possible difficulty of cessation.

- Eight questions of social participation that were adapted from Croucher et al (2007) were found to be culturally appropriate (Appendix 6C, 6D, Section 2). After piloting them the total questions became thirteen for the main study. Question number 3 (Have you spoken to relatives on phone?) was added as recommended by Stansfeld (2006). The following question 'In the last twelve months, how many times have you done the following 'Attended a meeting related to community/school/political party/association etc.?' was rephrased for clarification into the following four questions:

1. Attended school parents meeting or assembly?.
2. Attended political party or trade union meeting?.
3. Played sport / been to gym or exercise club/ been to adult or evening class?
4. Apart from khat chewing (takzeen) session, attended any Yemeni meetings?.

3.7 Sample selection process

The following steps were carried out to select the eligible khat chewers for the study:

Step I: Identifying khat sellers.

Step II: Recruitment of khat sellers.

Step III: Recruitment of khat chewers.

The project supervisor (RC) held a meeting in June 2006 with the heads of the Yemeni community in Sheffield to explain the aim of the study, to seek the collaboration of khat sellers and chewers with the researcher (SS) and to listen to the community's perceptions and concerns about khat chewing behaviour.

The geographic locations of khat sellers to the community were identified through social networking. Heads of the Yemeni community, gatekeepers in the Yemeni community and khat chewers were consulted. The locations identified were recorded. Thereafter, the researcher (SS) accompanied by volunteers from the community, visited these locations. The researcher briefed the khat sellers about the study and asked for their consent to allow her to recruit khat chewers in their places. The names of khat sellers who agreed to participate, the locations and time of their opening were listed to enable a time slot randomisation selection. During these visits khat sellers introduced the researcher to other khat sellers. In total, eight khat sellers were identified. Of these three refused to collaborate.

Step II recruitment of khat sellers followed. The opening times and days of the participating khat sale outlets were established (Appendix 7, Table 1). These were usually between 1:00 pm-10:00 pm for the four khat retailers whilst the wholesale retailer often opened between 10 am-3:00 pm. However, the morning was often for wholesale and midday onward for public sale. Khat was sold daily. A time table, which randomly allocated visits to khat sellers and times for these visits, was developed using a random numbers table. The day was divided into two sessions 1.00 pm-4.00 pm and after 4: pm onward (Appendix 7, Table 2).

A bilingual coloured poster describing the research (Appendix 8) was displayed in the khat sellers' and Yemeni community's' centres. Khat sellers were provided with the information sheet that explained the full study (Appendix 6E, 6F). This was then followed by pre-specified recruitment visits.

The final Step III for recruitment of khat chewers in khat sellers' places was conducted systematically as follow:

1. Step III (a) Identifying khat chewing purchasers and screening interview questionnaire:

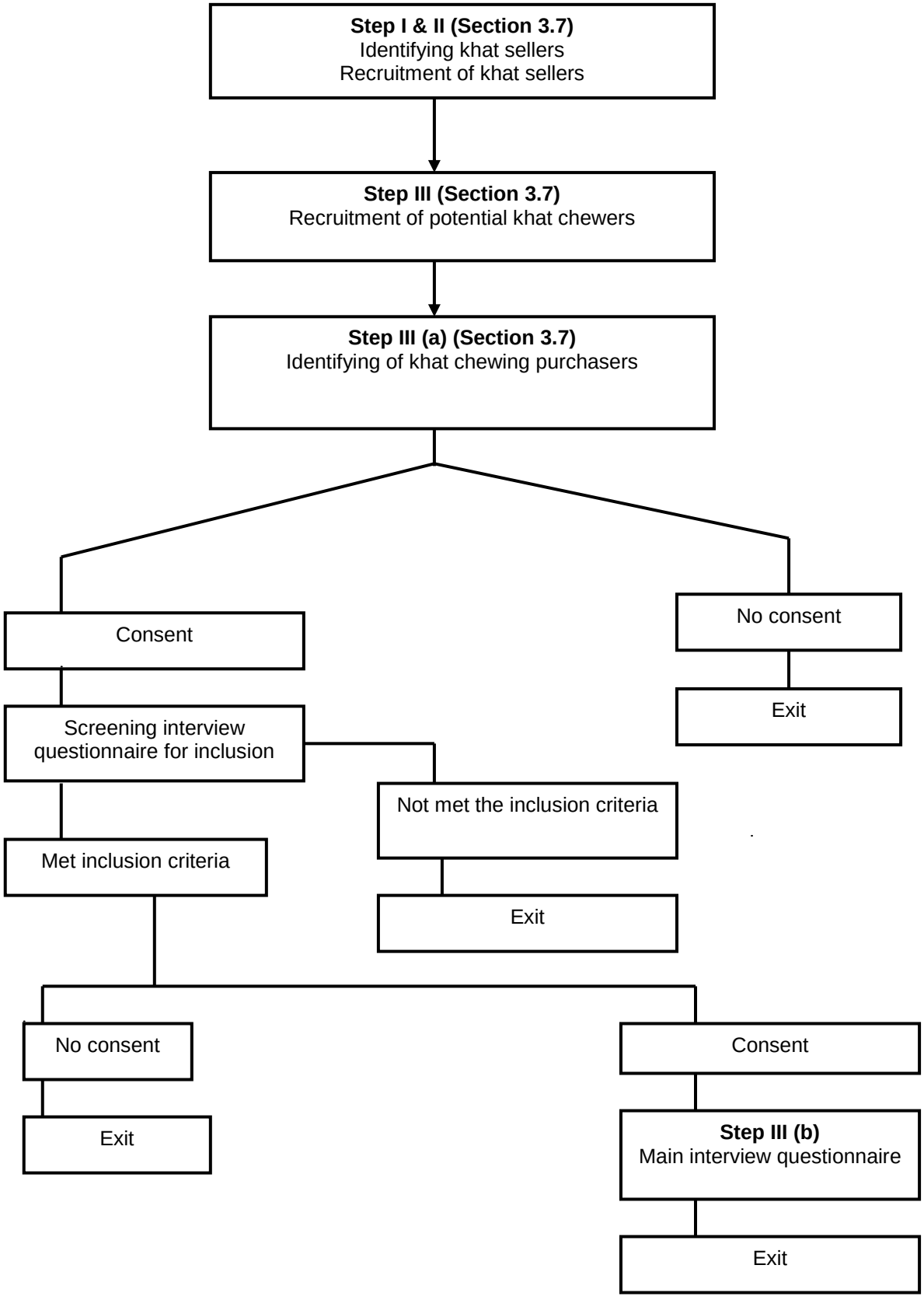
Chewers were approached and briefed about the study in the place of khat selling. Khat chewers who agreed to participate took part in a screening interview (Appendix 6A, 6B). Potential volunteers who met the inclusion criteria for the study were invited to take part in the main interview questionnaire (Appendix 6C, 6D). They were given an information and invitation sheet about the study (Appendix 6E, 6F). The study included only adult Yemeni male khat chewers aged 18 or above, who spoke Arabic or English, were currently resident in Sheffield, had regularly chewed khat (at least once weekly) over the preceding 12 months, were willing and capable to participate and would voluntarily provide biomarkers (saliva and expired carbon monoxide samples). The study excluded occasional chewers and chewers with temporary residency (visitors, students). Khat chewers with linguistic barriers (not speaking English or Arabic) and with physical disability were not recruited due to shortage of funding needed to interview the former and to ensure health and safety were in place in case of the latter. In addition, khat chewers with mental health problems and the terminally ill were excluded, as they were unable to give informed consent.

2. Step III (b) main interview questionnaire for khat chewers:

Potential volunteers who were selected in Step III (a) and to participate in the main interview questionnaire were either interviewed in place of khat sellers or given the opportunity to be interviewed during a convenient time and place.

Before the main interview questionnaire was carried out (Appendix 6C, 6D), the potential volunteers were asked to sign two pre-made consent forms (Arabic or English) (Appendix 4A, 4B and 4C, 4D). One of these consent forms was for the interview and the other was to be signed if they provided saliva. Confidentiality of the information that was obtained from chewers was assured throughout the interview. Participants were encouraged to ask for clarity of questions if they found them difficult to understand. Respondents were also given the opportunity to have one of their relatives or friends attend the interview with them. The researcher checked the questionnaire for any missing data and errors with respondents before they left. Finally, the respondents were thanked and exited from the study at the end of this interview. The schematic of sample selection process is presented in Figure 3.1.

Figure 3.1: Schematic of sample selection process



3.8 Study conduct

The data was collected between April and May 2007. The researcher took into consideration that this time of the year the community was not travelling. The sampling did not coincide with Ramadan, which might also preclude the community from participating. The researcher (SS) carried out the fieldwork, which involved administering both the screening and main Interview questionnaire and saliva and exhaled carbon monoxide (CO) collection. Timetable planning, piloting of the study, recruiting the potential volunteers, interviewing and data collection was also carried out by the same researcher (SS).

3.9 Development of main interview questionnaire

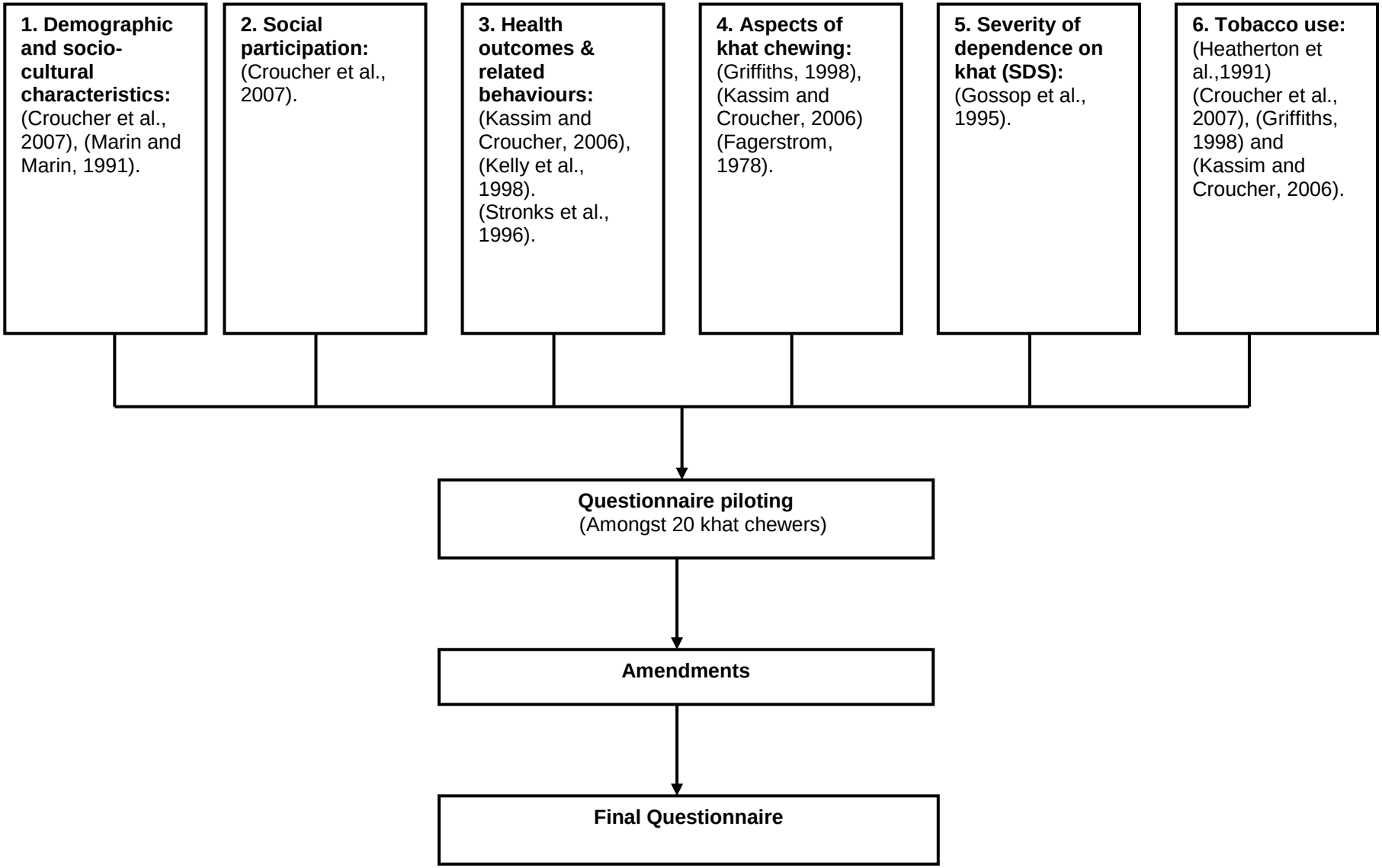
The six sections of the scheduled structured face to face interview questionnaire (main interview questionnaire) suggested for this study were developed, adapted and piloted from valid and reliable measures of demographic and socio-cultural indictors, psychosocial variables and health outcomes measures and health related behaviours (Figure 3.2).

These sections of the scheduled structured face to face interview questionnaire are as follows:

1. Demographic and socio-cultural characteristics:

Demographic characteristics included: age, marital status and family size. Marital status characteristics used were ‘Married’, ‘Divorced’, ‘Widow’ and ‘Single’ and were re-categorized into two categories ‘Married’ or in ‘Other marital status’. Age and family size were reported as continuous variables and were categorized into two groups according to the distribution (Chapter 4, Section 4.3.1).

Figure 3.2: Flow chart of main interview questionnaire development



A range of socioeconomic indicators were used to assess respondents' socioeconomic position. This was based on Liberatos et al (1988) who reported that multiple indicators have the advantage of providing more information and greater flexibility. These indicators included employment status and occupation type if employed, level of education completed, income, housing tenure and conditions and living area.

Level of education was reported as the highest level completed by the respondent. Level of education was re-coded as high 'some or completed college, university and postgraduate' and low 'Quranic school, primary school, secondary school, higher school'. The adaptation of these categories took into account that Yemeni residents might be none UK qualification holders. Level of education was supplemented by asking the respondent to report place of final completed level of education to aid categorization during data analysis.

Employment status information was explored by asking the respondent to choose one of the six responses in Appendix 6C, 6D, Section 1, and Q 8. Categories of employment status were re-combined into employed 'employed full/part time' or unemployed 'Unemployed and looking for work, out of work due to sickness/disability, retired from work and students'. This categorization has been used in other studies such as Lindstrom et al (2001). Current type of job was investigated to assign chewers to appropriate social class according to the six classes, that reduced to manual and non manual, as proposed by Registrar General's Social Class (RGSC) or to the current UK National Statistics Socio-economic Classification which based on the occupation title and responsibilities (NS-SEC) (Galobardes et al., 2006a). However, most respondents were found to

be unemployed or factory labourers, cleaners or security workers. Unemployed respondents were also asked to report the number of years/months of being unemployed alongside any alternative financial support they had. They were also asked if they had worked before and the type of job they had.

The other aspects of socioeconomic position of respondents investigated were home ownership and housing condition (crowding). Respondents were asked about their type of accommodation, whether 'Private', 'Owned' or other such as 'Local authority housing' (Appendix 6C, 6D Section 1, Q10). Home ownership was re-recorded as 'Owned' or 'other'. Housing over-crowding was explored through asking respondents the number of their home bedrooms and how many people lived with them during data collection (Appendix 6C, 6D Section 1, Q10 and Q11). Housing overcrowding categories was adapted from Croucher et al (2007). It was coded as one person living in one room as 'uncrowded' and two persons and more in one room as 'crowded'.

Questions related to respondents' acculturation were also asked. Language use as proposed by Marin and Marin (1991), was used to assess respondent' acculturation. These included skills such as reading 'Arabic', 'English', 'both English and Arabic' or 'other' and the language spoken at work and at home (Appendix 6C, 6D, Section 1, Q5, Q6 and Q7). Languages used for reading and speaking were re-grouped to 'English, both English and Arabic' or 'Arabic or other'. Years of residency in the UK and country, city or village of birth (Appendix 6C, 6D. Section 1, Q2 and Q3) was ascertained. Country of birth was categorized into 'Yemen' or 'UK or elsewhere'. Responses for years of residency were

dichotomized according to distribution (Chapter 4, Section 4.3.1) into ‘long’ and ‘short’ period of UK residency.

Safety and level of deprivation of places where khat chewers were living were explored. This included questions about their local social environment and perception of whether it was friendly or hostile (Appendix 6C, 6D, Section 1, Q12 and Q13). Postcodes were used in this current study as proxy for the deprivation level of areas where respondents lived (Appendix 6C, 6D, Section 1, and Q14). It was categorized into ‘Sheffield 3 and 4’ and ‘elsewhere’.

2. Social capital of the Yemeni community was assessed through using a relevant index from Croucher et al (2007). Aspect of social capital that included social contacts and social networks of the Yemeni community were labelled in this study as social participation. Six statements using Likert type scores ‘Not at all’, ‘Once or twice’,’ Three to six times’, ‘More than six times’ and ‘Not applicable’ were used. These statements included the following: a) Informal social contact: (within the Yemeni community). This consisted of visiting or calling family, friends and neighbours. b) Community group participation included a mix of social and civic participation (within the host community). These were school meeting, mosque attendance, sport practicing and political party participation. Croucher et al (2007), suggested that ‘Not at all’ and ‘Not applicable’ score as 0, ‘Once or twice’ as 2, ‘Three to six times’ as 6 and ‘More than six times’ as 9 scores. The sum scores for these statements were 117. Two categories of social participation were created according to the distribution reported in Chapter 4, Section 4.3.2. These were ‘Low’ (0-39 score) and ‘high’ (40 score and more).

3. Respondents’ general and oral health alongside relevant behaviours was investigated.

The general health of respondents was assessed with a single global item 'How would you describe your current state of health in general?'. Question responses were formed of five items measured on an ordinal scale (Very Good, Good, Fair, Bad, and Very Bad). It was conventionally divided into two categories (Sanders et al., 2006; Wu and Rudkin, 2000). In this study 'Very Good and Good' re-categorised as uncompromised and 'Fair/Bad/Very bad' as compromised.

A dichotomised health related question 'Do you have any health condition (s)?', was asked (Croucher et al., 2007) (Appendix 6C, 6D Section 3.1 Q2). Respondents answering positively were asked to report the health conditions they had and their responses were added up.

Oral health and related behaviours were also explored. Kassim and Croucher (2006) reported a relationship between khat chewing and self-reported oral problems. A dichotomised oral health related question 'Do you have any oral problem (s) such as pain /gum disease or any other?' was asked (Appendix 6C, 6D, and Section 3.2 Q1). These positively responding were asked to report all the oral problems they had and a sum score for every chewer was created.

In addition, questions from the Adult Dental Health Survey (Kelly et al., 1998) were used to assess respondents' pattern of dental attendance and registration with dentist/dental practice (Appendix 6C, 6D Section 3.2 Q2 and Q3). The responses were re-grouped into 'Regular', 'In pain' or 'Never been/go to the dentist'. Responses for dental registration were coded as 'Yes or 'No'. Period of non-registration was also asked and dichotomised according to the distribution (Chapter 4 Section 4.3.3).

4. Type of khat, age and place starting chewing, social aspects of khat chewing, behaviours related to khat chewing and attempts to stop chewing alongside of validation of self-reported khat chewing were investigated in this section. Khat chewers were asked to report whether they chewed 'Herari', 'Yemeni', 'Mirra' or 'Other' khat. The place started chewing alongside the age when first started chewing was then asked. The latter (age) was dichotomized according to the distribution into two groups reported (Chapter 4.section 4.3.4). The former was re-grouped into 'Yemen' and 'UK or elsewhere'. Next, initiators of khat chewing were explored. Chewers were asked to choose one of the following initiators: 'Close friends', 'Casual acquaintances', 'Wife', 'Father', 'Other family member' 'Bought it yourself' 'Other'. Questions related to social influences were followed. Two questions related to parents (father, mother) chewing khat were asked using dichotomized responses. Other social influences of khat chewing were also asked. Respondents were asked to respond 'Yes' or 'No' whether they had a close friend chewing khat and whether their partner also chewed khat currently. The question 'Why do you chew khat nowadays?' was followed. Respondents were offered to choose one of the following: 'A habit', 'Social interaction', 'Help pass the time', 'Help concentration during study and work', 'Isolation', 'Dependence', 'No alternatives for khat chewing' and 'Other'.

Behaviours related to khat chewing were explored using modified items from Fagerstrom (1978), Griffiths (1998) and Kassim and Croucher (2006).

Respondents were asked to report whether they chewed also with 'Others from community', 'By yourself' or 'Other'. The number of days respondents chewed was explored and this was categorised into two groups according to distribution into '2

days or less' or '3 days or more'. Time started chewing was also asked 'Between 1.00-3.00 pm', 'Between 3-6 pm' or 'after 6:00pm'. The latter two categories were re-combined. In addition, the amount of khat chewed in khat chewing session currently and in the 12 previous months was investigated. This was categorised into two groups according to the distribution 'Up to 1 bundle 'or '1.25 bundles and more' for the former and 'Up to 1 bundle 'or '1.50 bundles and more' for the latter.

Furthermore, respondents were asked to report whether they chewed more khat during the first hours, number of hours chewing in a khat chewing session, chewed even when ill and whether swallowed khat juice. Finally, respondents were asked to report the difficulty of spending the whole week without chewing khat. Responses were collapsed into two categories 'Very easy' or 'Fairly easy'' and 'Fairly difficult or 'Very difficult'.

A composite index of khat behaviour was constructed from these aforementioned variables. These behaviours were first scored as 0 (absence) or 1 (presence). The range of these scores was 0-10. According to the distribution it was then categorised into 'low' or 'high' composite index khat behaviour (Appendix 9A).

This section concluded with questions related to respondents' wanting to stop khat chewing and their level of want (Appendix 6C, 6D, Sections 4, Q24 and Q25). Respondents were also asked if they had tried to stop chewing, the number of their attempts (if any) to give up and the barriers for not succeeding in giving up khat chewing (Appendix 6C, 6D, Section 4, Q26, Q27). Finally, questions about education and information related to khat chewing effects and how respondents received it were included as well (Appendix 6C, 6D, Section 4, Q28, Q29, Q30).

5. Khat dependence was measured by the Severity of Dependence Scale (SDS) (Gossop et al., 1995). This scale (SDS) will be called onwards as SDS-khat as recommended by Gossop et al (1995). This scale (Appendix 6C, 6D, Section 5) was mainly developed to measure psychological dependence upon different drugs. It was reported as a reliable, internally consistent and valid measure of pre-occupation with anxiety about drug taking in the preceding 12 months (Gossop et al., 1995; Topp and Mattick, 1997 b). It has been culturally adapted among English and non-English participants (Gossop et al., 1995; Ferri, 2000). In addition, SDS-khat had been recently used to explore khat dependence among Somali and Yemeni Khat chewers (Griffiths et al., 1997; Kassim and Croucher, 2006). It consists of five items that measure dependence over the last 12 months. It uses four scale scores for four items, 'Never or almost never', 'Sometimes', 'Often', 'Always or nearly always' and with 'Not difficult', 'Quite difficult', 'Very difficult', 'Impossible' for one item. Scores for each item range from 0-3 and the total score ranges from 0-15.

Varied cut off points was reported for different substances (Topp and Mattick, 1997 b; Gonzalez-Saiz et al., 2009; Lawrinson et al., 2007; Kaye and Darke, 2002). In this study the cut off point adapted was 5 scores for 'Non-dependent' and 6 scores and more for 'Dependent'. According to the distribution these scores were validated with the composite index of khat behaviour (Chapter 4. Section 4.3.5). Reliability of SDS which included test-retest reliability (intraclass correlation coefficient) has been reported for range of substances Ferri et al (2000) and Gossop et al (1997). Finally, the construct validity was assessed statistically using principal components extractions. The findings showed that single factor solution was obtained (Gossop et al., 1995; Gonzalez-Saiz et al., 2009; Lawrinson et al.,

2007; Ferri et al., 2000). Reliability and construct validity were investigated in this study and reported in (Chapter 4, Section 4.3.5).

Finally, Section Six of the questionnaire investigated tobacco use amongst respondents. This section commences with an introductory question about whether khat chewer is currently a regular tobacco smoker or not (Appendix 6C, 6D Section 6). Respondents responding negatively were asked (Appendix 6C, 6D Section 6.2) if they smoked when chewing khat and labelled as episodic smoker respondents (ESR), if they responded positively.

Both regular smokers and ESR were then asked to report other tobacco products (Cigarettes, Cigar, Shisha, Cigarettes and Shisha, Other or None) used prior to the last 12 months alongside their current primary tobacco product use. The current tobacco smoking products, amongst regular smokers and ESR, investigated in this study was ‘Cigarette’, ‘Cigar’, ‘Shisha’, ‘Cigarette and shisha’ and ‘Other’.

Main current tobacco use amongst regular smokers was cigarettes and shisha is as a supplement during chewing. Therefore, regular shisha smoking and cigarette and shisha smoking sections were omitted from the main interview questionnaire.
For regular smokers (Appendix 6C, 6D section 6.1), the social environment of tobacco smoking was investigated. Age of starting smoking tobacco was asked and categorized into three groups ‘10-15 years’, ‘16-19 years’, 20 years and older.
Place of starting cigarette smoking was also asked and grouped into ‘UK or elsewhere’ and ‘Yemen’. Initiators of smoking amongst regular and ESR smokers were explored. Possible responses were ‘Friends’, ‘Family, ’khat chewing’ or ‘other’ initiator. These categories were re-grouped into ‘Social’ (friends, family),

‘Environmental’ (khat chewing) and ‘Other’. Questions investigating parents, friends and current partners or friend’s cigarette smoking status amongst regular smokers were asked. The responses were recorded as ‘Yes’ or ‘No’. Additional questions investigating parents’ use of other tobacco products such as mada’a (water pipe) were also asked.

Tobacco smoking behaviours associated with khat chewing were also investigated. Respondents, whether regular or ESR smokers, were asked whether they were ‘Much more likely to smoke cigarettes’, ’More likely to smoke cigarettes’, ‘Much less likely to smoke cigarettes’, ‘Likely to smoke cigarettes just the same’ or ‘Less likely to smoke cigarettes’ during chewing khat. The former two responses were re-grouped as ‘Much or more smoking cigarettes/shisha ’ and the latter three responses were collapsed as ‘Same or less cigarettes /shisha smoking’.

Number of cigarettes smoked during chewing for both groups was also recorded (episodic shisha smokers were excluded) and was categorized into light ‘Up to 10 cigarettes’ and heavy ‘11 cigarettes and more’. Respondents were also asked to respond whether their current smoking with khat compared to 12 months had ‘Increased’,’ Decreased’, or ‘Remained the same’. Two questions asked whether both groups of tobacco smokers smoked more during the first hours of chewing and whether they carried on smoking after spitting khat. The responses for both these questions were dichotomized.

Level of nicotine dependence amongst regular smokers was assessed by the shortened version of six questions of the Fagerstrom Tolerance Nicotine Dependence scale (FTND) (Heatherton et al., 1991) (Appendix 6C, 6D, Section

6.1.1 Q1-6). The total score for this test was 10 with a range of dependence from 0-2 ‘Very low’, 3-4 ‘Low’, 5 ‘Medium’, 6-7 ‘high’ and 8-10 ‘Very high dependence’ (Fagerstrom et al., 1990). According to the distribution of the scores reported in chapter 4, Section 4.3.6, page 142**,** regular smokers were categorized with ‘Low’ (0-5) and ‘high’ (6 scores and more) nicotine dependence.

Questions whether regular smokers found it easy or difficult to stop smoking and whether they wanted to stop smoking were asked. A matching question for both regular and ESR smokers about whether they had tried to stop smoking and number of cessation attempts was asked. Both regular and ESR smokers were asked if they smoked both shisha and cigarette during chewing and if they used their own shisha or shared it with other when chewing khat (Appendix 6C, 6D, Section 6.1.1 Q11, Q12 and Section 6.2, Q5, Q6). An open-ended question about the reason for smoking tobacco when chewing khat amongst ESR and regular smokers was also asked (Appendix 6C, 6D, Section 6.1, Q14 and Section 6.2, Q12).

Finally, self-reported tobacco smoking and khat chewing was objectively validated (Appendix 6C, 6D, Section 6.3). Expired air carbon monoxide (CO) was collected to assess the reliability of self-reports of tobacco smoking status (Jarvis et al., 1987) using a Bedfont EC-50 carbon monoxide monitor (Bedfont Scientific, Rochester, Kent, UK) and a standardized protocol. Respondents were asked to exhale fully and to inhale fully and then hold the air for 15 seconds. These who could not hold the air was asked to hold the air as long as they could. After that the respondent was asked to exhale slowly and fully into the mouth piece (Middleton and Morice, 2000). The cut off level of CO score of 6 pmm for distinguishing

smokers from non-smokers was adopted. As for self-reported khat chewing, saliva samples were collected. Respondents were asked to keep a cotton-wool dental roll in mouth until it was saturated. Salivary cathinone levels were measured using gas chromatography analysis described in Appendix 9B.

3.10 Data analysis

The data collected was entered onto computer and analysed using the Statistical Package for Social Science (SPSS for Windows, version 16). Data analysis was conducted in two phases.

In phase I the following steps were undertaken:

- Screening and cleaning of the data.
- A descriptive analysis to report sample characteristics and explore the nature of continuous and categorical explanatory variables was conducted.
- Manipulation of raw continuous variables followed according to the distributions. Medians with the corresponding range were reported in place of means for non-normally distributed variables. Re-categorization of the categorical variables of interest to test study hypotheses was conducted as described earlier (Section 3.9).
- Dependent variables (health outcomes) investigated; their categories and cut off points are grouped and presented below in Table 3.1.

Table 3.1: Health outcomes investigated in the study

Health outcomes variables	Categories
Self-rated health	Very Good and Good 'uncompromised' Fair/Bad/Very bad 'compromised'
Self-reported oral problems and /or pain	No Yes
Self-reported health conditions	No Yes
Self-reported 'high' nicotine dependence as measured by (FTND)	Medium/low or Very low dependence 'low' (≤ 5 scores) High or Very high dependence 'high' (≥6 scores and more)

- Two steps were undertaken to validate SDS-khat. An exploratory factor analysis was used to investigate its construct validity. The data set was considered for suitability for factor analysis using conventional tests. These include, observation of values 0.6 or above for Kasier-Meyer-Olkin Test, significance level (P≤0.05) for Bartlett's Test of Sphericity and correlation matrix of many coefficients of .3 and above. The factorability of the component proposed by the developers and the literature was compared to the results of this study sample. The eigenvalues of the components exceeding 1 and the variance explained were observed. The Catell's scree test that plots each of the factors against its associated eignvalue was displayed. The second step of construct validity was undertaken including simple logistic regression of the scale categories with the composite index categories of khat behaviour.
- The reliability of the SDS scale was assessed using both test-retests and internal consistency. Fifteen khat chewers were re-interviewed. Interviews of some chewers were carried out on the same day of the main interview as recommended by Gossop (2003). However, other chewers who were not available on the same day of the main interview were re-interviewed on consecutive days. The internal consistency of the SDS scale was tested using Cronbach's alpha coefficient (Cronbach, 1951).
- Non-parametric analysis Mann Whitney U Test was carried out to explore differences in expired carbon monoxide measures when chewing khat and other times amongst two groups of regular cigarettes smokers as well as ESR. The criteria of effect size of difference was followed (Cohen, 1988).

Phase II analysis involved two steps.

- In step one analysis, as the outcomes of interest were binary, chi-square (χ^2) and simple logistic regression analysis were performed to detect any statistically significantly association at P≤0.1 between explanatory variables and health outcomes. At this stage crude odd ratios and corresponding confidence intervals were also calculated.
- Variables were entered into a multivariate model, based on a theoretical background and on use of lax criterion (P≤0.1) (Altman, 1999). This suggests that variables may contribute to a multiple regression model in unforeseen ways due to complex interrelationships among the variables. Multi-collinearity at this step using Spearman rank order correlation (rho) was also checked between selected explanatory variables before entering into the model.
- In step two analysis, to model the relationship between the explanatory variables and the health outcomes investigated, a hierarchical sequence of entering the selected explanatory variables (Chapter 2 Figure 2.1) was followed (Victora et al., 1997). This strategy was employed for all the health outcomes investigated.
- The distal variables included in the first stage were the demographic and socio-cultural variables. Psychosocial variables were entered in the next stage. The proximal variables included in the third stage of model were the behavioural variables, mainly khat chewing, tobacco smoking and pattern of dental attendance. Goodness of fit (Hosmer-Lemeshow) for the model was assessed (Field, 2009) at each block and likewise the overall goodness of fit for the model after entering all the variables.

3.11 Summary

- Two hundred and four Yemeni khat chewers who were permanent residents of Sheffield were interviewed using a structured interview scheduled.
- Random visits to places where khat was sold or sold and chewed were carried out to recruit and interview respondents.
- Sub-samples of self-reported khat chewing and tobacco smoking were validated with a biomarker of khat metabolite (cathinone) in saliva and expired carbon monoxide (CO).
- The data collected was analysed using SPSS16. Descriptive and analytical data analyses were performed.
- Validity and reliability of the scale used for measuring khat dependence was explored.
- Non-parametric analyses (chi-square-χ^2) and simple logistic regression were first used to explore significant associations between dependent variables (health outcomes) and explanatory variables (demographic, socio-cultural, psychosocial and behavioural explanatory variables).
- Binary logistic multiple regression analyses were used to model the relationships of dependent variables (health outcomes) with explanatory variables.

Chapter 4. Results

4.1 Introduction

This chapter presents the results of the study data analysis. Section 4.2 describes the participants' responses and the final sample size that was analysed. Phases of data analysis follow. Section 4.3 involves the description of Phase l data analyses. This Phase l gives a descriptive overview of the sample. Section 4.4 reports the findings of Phase II univariate and multivariate analysis. A summary of the results for both phases is described in Section 4.3.7 and 4.4. 5.

4.2 Participants' responses and final study sample

The final study sample size was 204 respondents. Fifteen respondents did not take part during the process of participants' selection. Amongst the selected respondents 124 were recruited in places where khat was sold and chewed. The remainder were recruited in places of selling khat alone. Of these 204 respondents, 186 respondents voluntarily supplied a saliva sample. Forty-seven samples of saliva were analysed.

4.3 Phase I: Descriptive overview of the sample

In this section the demographic and socio-cultural characteristics of respondents, social participation of respondents, health outcomes, aspects of khat chewing including reliability and validity of scale measuring khat dependence and tobacco use alongside level of nicotine dependence are described.

4.3.1 Demographic and socio-cultural characteristics of respondents

The mean age of respondents was 44.84 years (SD ±19.70) and the median 40.00 years (range 18-87).

Table 4.1 shows that the number of 18-29 years, 30-40 years, 41-64 years and 65-years and older, was 62(30%), 41(20%), 50(25%) and 51(25%), respectively. Married respondents accounted for 77% and one hundred and fifty five respondents (76%) reported having children with a mean number of 4.37 child (SD±2.51) and median 4.00 child (range 1-11). Fifty three percent (53%) had 4 or less children and 47% had 5 children or more.

Respondents reported a range of levels of completed education. Sixty six percent of respondents had completed a higher school education and less and the remainder had completed some college education and more. Most respondents (72%) had completed their last level of education in Yemen.

There were 35% employed respondents (full or part time). The period of unemployment was reported from 2 to 360 months with a mean value of 109 months (SD±99) and the median as 78 months. Amongst unemployed respondents, 33% were in receipt of job seekers allowance, 42% received pension and the remainder were in receipt of different types of allowances (Appendix 10A, Table A.1). Of the 204 respondents in this current study, 34% were Council Housing tenants, 18% were shared private tenants, 16% were Housing Association tenants, 10% owned their home and the remaining respondents either lived with their families or had a private tenancy.

According to the definition of housing overcrowding adopted in this study (Chapter 3, Section 3.9), fifty nine percent of respondents were living in uncrowded housing and 41% in overcrowded housing. At the time of data collection most respondents (73%) were living in either Sheffield 3 (22%) or 4 (51%). Ninety eight percent of

respondents reported living in a friendly neighbourhood and not having hostile or threatening neighbours.

Eighty three percent of respondents were born in Yemen. Forty seven percent of these were born in villages cultivating khat in Yemen. The mean score of UK residency for the respondents was 236.09 (SD ±199.10) and the median 150 (range 12-660) months. Long residency (over 151 months) was reported by 50% of respondents.

Amongst 50.5% of respondents the preferred reading language was Arabic. Ninety three percent (93%) of employed respondents spoke English most of the time during work. Apart from respondents who were living alone (16%), the preferred language of speaking at home was reported by 78% as Arabic.

4.3.2 Participation within the Yemeni and host community

The mean score for social participation was 41.24 (SD ±19.55). The median was 39.00. The scores ranged from 2-102 and were categorised according to the median into low and high social participation. Forty nine percent of respondents reported low levels of social participation (score range 0-39) and 51% high levels of social participation (40 scores and more).

With respect to social exchange of respondents within their own Yemeni community (Table 4.2), 42% of the respondents had no family to visit in Sheffield. Of the remainder forty nine percent reported visiting their families more than six times per month in the 12 months prior to the interview. Other family contacts such as speaking to family members are presented in Appendix 10A, Table A.2 and 3. Of the 199 respondents, 33% had not visited Yemeni friends, 30% visited Yemeni friends once to twice and only 12% visited Yemeni friends more than six times per

Table 4.1: Demographic and socio-cultural characteristics of a sample of UK resident adult male Yemeni khat chewers

Demographic and socio-cultural characteristics variables	N	(%)
Age groups (n=204)		
18-29 years	62	(30.4)
30-40 years	41	(20.1)
41- 64 years	50	(24.5)
65 years and older	51	(25.0)
Marital status (n=204)		
Married	156	(76.5)
Divorced or widowed	11	(5.4)
Single	37	(18.1)
Family size (n=155)		
1 or 2 children	43	(27.7)
3 or 4 children	40	(25.8)
5 and more children	72	(46.5)
Level of education completed (204)		
Quranic Schools	41	(20.1)
Primary school	31	(15.2)
Secondary school	25	(12.3)
Higher school	37	(18.1)
Some college	19	(9.3)
Completed college	4	(2.0)
Some university	19	(9.3)
University degree and above	28	(13.7)
Place of education completed (204)		
Yemen (Other)	103	(50.5)
UK	60	(29.4)
Yemen (Quranic Schools)	41	(21.1)
Employment status (204)		
Employed (part or full time)	72	(35.3)
Unemployed	132	(64.7)
Housing tenancy (204)		
Local Authority Housing (Council)	70	(34.3)
Housing Association	33	(16.2)
Owned	21	(10.3)
Privately rented	27	(13.2)
Privately rented and shared with other	36	(17.6)
Living with family	17	(8.3)
Housing conditions (203)		
Uncrowded	120	(59.1)
Overcrowded	83	(40.9)
Living areas (204)		
Sheffield 3 or 4	149	(73.0)
Elsewhere	55	(27.0)
Country of birth(n=204)		
Yemen	170	(83.3)
UK	24	(11.8)
Other	10	(4.9)
Place of birth (n=204)		
Yemen khat village	95	(46.6)
Yemen elsewhere	75	(36.8)
Other	34	(16.7)
Preferred reading language (n=204)		
English	41	(20.1)
Arabic	103	(50.5)
Both English and Arabic	45	(22.1)
Other	15	(7.4)
Speaking language at work (n=72)		
English	67	(93.1)
Arabic	2	(2.8)
Both English and Arabic	3	(4.2)
Speaking language at home (n=171)		
English	14	(8.2)
Arabic	133	(77.8)
Both English and Arabic	24	(14.0)

month, in the 12 months prior to the interview. The number of times Yemeni friends visited respondents is reported in Appendix 10A, Table A.4.

When respondents were asked if they had contacted their Yemeni friends through phone calls, 58% of respondents reported speaking to Yemeni friends more than six times per month in the 12 months prior to the interview. Twenty six percent of respondents reported not having Yemeni neighbours to visit and 47% visited their Yemeni neighbours three to more than six times. The number of visits of Yemeni neighbours to a respondent is reported in Appendix 10A, Table A.5.

The participation of respondents in Yemeni community activities, such as community meetings was reported by 93% as 'Not at all' or only 'Once or Twice' per month, in the 12 months prior to the interview (Appendix 10A, Table A.6). However, 81% of respondents had attended mosque prayers 'Three to six times' or 'More than six times' per month, in the 12 months prior to the interview.

As for the participation of respondents in the host Sheffield community, respondents were asked about how many times per month they had attended a political party or trade union meeting or attended school parents meetings or assemblies in the 12 months prior to the interview. Of 202 respondents a large percentage (72%) responded 'Not at all'. Among the 86 respondents who had children at school, 66% reported 'Not at all' or 'Once or twice' and the remaining 'Three to more than six times' monthly in the 12 months prior to the interview (Table 4.2) . Other activities such as playing sport or going to classes are reported in Appendix 10A, Table A.7

Table 4.2: Social participation and contacts of respondents within the Yemeni and host community monthly, in the last 12 months, in a sample of UK resident adult male Yemeni khat chewers

Social Participation and contact variables	N	(%)
Visits to family (n=119)		
Not at all	8	(6.7)
Once or twice	22	(18.5)
Three to six times	31	(26.1)
More than six times	58	(48.7)
Visits to Yemeni friend (n=199)		
Not at all	66	(33.2)
Once or twice	60	(30.2)
Three to six times	49	(24.6)
More than six times	24	(12.1)
Calls to Yemeni friend (n=199)		
Not at all	15	(7.5)
Once or twice	37	(18.6)
Three to six times	32	(16.1)
More than six times	115	(57.8)
Visits to Yemeni neighbours (n=152)		
Not at all	34	(22.4)
Once or twice	46	(30.3)
Three to six times	39	(25.7)
More than six times	33	(21.7)
Prayer attendance (n=204)		
Not at all	23	(11.3)
Once or twice	15	(7.4)
Three to six times	52	(25.5)
More than six times	114	(55.9)
Meetings attendance (n=202)		
Not at all	146	(72.3)
Once or twice	52	(25.7)
Three to six times	3	(1.5)
More than six times	1	(0.5)
School activities attendance (n=86)		
Not at all	21	(24.4)
Once or twice	36	(41.9)
Three to six times	15	(17.4)
More than six times	14	(16.3)

4.3.3 Health outcomes and related behaviours

Table 4.3 reports that sixty percent of respondents self-rated ‘Very good’ and, ‘Good’ health and 40% ‘Fair’, ‘Bad’ and ‘Very bad’ health. Sixty two percent of respondents self-reported not having any health condition. The mean number of health conditions among the 77 reporting health conditions was 1.61 (SD±0.92, range 1-5) (Appendix 10A, Table A.8). Fifty eight percent reported one health condition and the remainder two or more (Appendix 10A, Table A.9). Health conditions and self rated ‘compromised’ health increased with age (Appendix 10A, Table A.10 and Table A.16). Self-rated ‘compromised’ health respondents had more health conditions (Appendix

10A, Table A.11). Amongst the respondents who self-reported a health condition 30% reported a heart condition and 29% reported being diabetics. Other self-reported health conditions are presented in Appendix 10A, Table A.12, 13 and 14.

Twenty nine percent of respondents reported current oral problems (Table 4.3). The mean number of oral problems reported was 1.61 (SD±0.49) and the median 2 (range 1-2). Thirty eight percent of respondents reporting oral problems had one oral problem and the remainder (62%) had two oral problems (Appendix 10A, Table A.15). Of the 60 self-reported oral problems respondents 77% had dental decay or missing teeth, 47% gum problems (inflammation, pockets and pain) and 15% other (dental appliance, dry mouth and TMJ problems). Thirty two percent of the respondents reported not being registered with a Dentist/Dental practice. The median period of respondents' duration of non-registration was 36 months (range 1-180). Thirty eight percent of respondents reported attending a dentist for regular checks often once or twice a year or occasionally. Forty four percent of respondents reported dental pain as a reason for visiting the dentist. The total percentage of respondents who never attended for a regular oral check up or only attended when in pain/or for oral problems was 62% (Table 4.3).

Table 4.3: Health outcomes and related behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Health outcomes and related behavioural variables	N	(%)
Self-rated health		
Very good	35	(17.2)
Good	87	(42.6)
Fair	53	(26.0)
Bad	26	(12.7)
Very bad	3	(1.5)
Self-reported oral problems		
Yes	60	(29.4)
No	144	(70.6)
Registration with Dentist/Dental practice		
Yes	139	(68.1)
No	65	(31.9)
Pattern of dental attendance		
Regular check up	76	(37.3)
Occasional check up	2	(1.0)
Only when in pain	90	(44.1)
Never been/go to the dentist	36	(17.6)

4.3.4 Aspects of khat chewing

This section describes the social and behavioural backgrounds of khat chewing, the desire to stop chewing, any attempts to stop khat chewing, the factors for re-starting chewing, education/information about khat impacts and a validation of self-reported khat chewing and khat dependence- SDS-khat.

In this sample the majority of respondents (79%) started khat chewing in Yemen. Ninety three percent of khat chewers preferred chewing Herari khat from Ethiopia and the rest chewed Mirra khat from Kenya, Yemeni khat or had no preference. The mean age of starting khat chewing was 18.53 years (SD± 5.48) and the median 18 years (range 7-30).

Table 4.4 reports that the initiation of khat chewing started from age seven years and by the age of 18 years more than half of the respondents had already started this behaviour. Fifty four percent of respondents were introduced to khat chewing by friends and 35% by family, family member, or during work on family khat land. Among the remainder (11%), 8% reported that the availability of khat promoted self-initiation of khat chewing and the rest (3%) reported a belief in the medical benefits of khat chewing.

Family and friends' khat chewing was explored. Eighty percent and 19% of respondents' fathers and mothers were khat chewers. Forty three percent of respondents were living with khat chewers and 94% reported having a close friend chewing khat. Many reasons were reported for khat chewing, most commonly 'Social interaction' (48%) and 'Habit' or 'Dependence' (21%). A high percentage of respondents (86%) chewed khat in groups. The most commonly reported time for starting khat chewing was between 1.00 pm - 6.00 pm while a small percentage

(7%) preferred after 6:00 pm. Morning khat chewing was not reported. The mean number of bundles chewed during a khat session was 1.48 bundles (SD± 0.63) and the median was one bundle (range 0.25-3.5) per session. Sixty two percent of respondents reported chewing 1.5 khat bundles per session or less and the remainder reported chewing two bundles or more. The mean length of a khat chewing session was estimated as 5.85 hours (SD±1.94) and the median as 6.00 hours (range 2-12).

The mean number of days per week spent in khat chewing was 2.95 days (SD±1.98). The median was two days (range 1-7). The distribution of number of days per week chewing khat showed deviation from a normal distribution. Fifty three percent of respondents reported chewing khat for two days or less and only 14% chewed daily. Almost all the respondents (99.5%) reported Saturday as the most common day for chewing khat. This was followed by 48% of respondents reporting Thursday. The least popular day was Sunday reported by only 24% of respondents. Forty six percent of respondents wanted to stop khat chewing. Of these 72% 'Quite or Very strongly' wanted to give up khat chewing. Forty eight percent of respondents had tried to stop khat chewing.

The mean number of attempts was 3.77(SD ±3.55) and the median 3.00 attempts (range 1 to 20). Many factors were reported for re-starting khat chewing. These included: most commonly 'Isolation from own Yemeni community' by 48.5%, 'Depression' by 15.5%, 'Dependence' by 8.2%, ''To avoid alcohol' by 7.2%, 'Cannot study or work without khat' by 4.1%, 'No alternative to khat chewing' by 6.2%, 'Other reason such as medical benefit' by 6.2% and 'To pass time' by 4.1%.

Table 4.4: Social and behavioural backgrounds of khat chewing in a sample of UK resident adult male Yemeni khat chewers (n=204)

Social and behavioural background of khat chewing variables	N	(%)
Age of starting khat chewing		
From 7-15 years	57	(27.9)
From 16-18 years	55	(27.0)
From 19 -21 years	45	(22.1)
From 22 years to older	47	(23.0)
Initiators of khat chewing		
Close friend	111	(54.4)
Father	8	(3.9)
Other family member	9	(4.4)
Bought myself	16	(7.8)
Family and family land	54	(26.5)
Other	6	(2.9)
Father chewing khat		
Yes	164	(80.4)
No	40	(19.6)
Mother chewing khat		
Yes	39	(19.1)
No	165	(80.9)
Partner chewing khat		
Yes	87	(42.6)
No	117	(57.4)
Close friend chew khat		
Yes	191	(93.6)
No	13	(6.4)
Reasons for chewing khat		
Habit and dependence	43	(21.1)
Social interaction	98	(48.0)
Help pass time	36	(17.6)
Help concentration during work and study	12	(5.9)
No alternatives to khat chewing and other reasons^	9	(4.4)
Isolation	6	(2.9
Khat chewing setting		
With others	175	(85.8)
By yourself	22	(14.2)
Time preferred for starting chewing		
Between 1.00-3.00 pm	92	(45.1)
Between 3.00-6.00 pm	97	(47.5)
After 6.00 pm	15	(7.4)
Khat bundles chewed in a khat session		
Up to 1 bundle	105	(51.5)
1.25 bundle and more	99	(48.5)
Number of hours chewing khat per session		
Up to six hours	147	(72.1)
More than 6 hours	57	(27.9)
Number of days chewing khat per week		
1-2 days	109	(53.4)
3 days and more	95	(46.6)

^E.g. to avoid shopping

A majority of respondents (52.5%) had not received any education or information about khat and its effects. Of respondents who had received education and information about khat and its effects 42% received this through personal education (e-reading and books). Other sources reported by the remainder

included ‘Lectures or Leaflets’ by 36%, ‘Medical consultants or health visitors or General practitioner or Family advice’ by 17% and ‘Personal experience’ by 5%.

As for self-reported khat chewing, after exclusion of one saliva sample, the mean level of cathinone in 46 saliva samples was 7.98 µg/mL (SD±8.20) and the median 5.30 µg/mL (range 0.10-26.30).

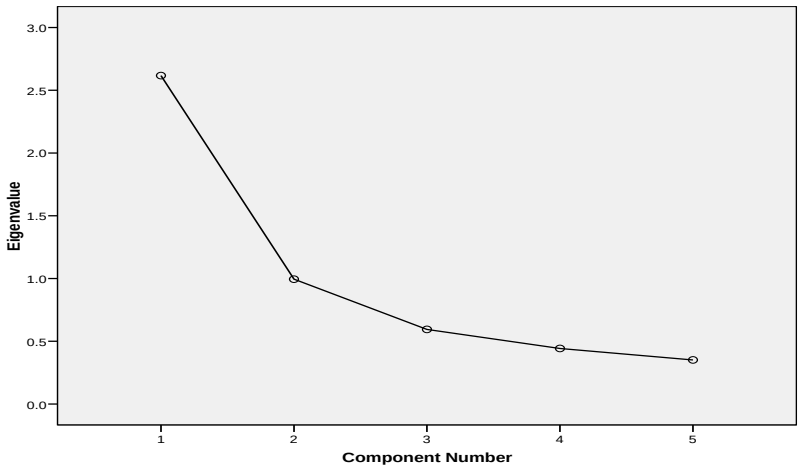
4.3.5 Severity of dependence on khat (SDS-khat)

The distribution curve of SDS-khat scores suggested deviation from normality (Appendix 10C, Figure 1). The mean score of the SDS-khat was 5.52 (SD± 4.03) and the median was 6.00 (range 0.00-15.00). Fourteen percent (14%) of respondents scored zero, 35% between 1-5 scores and the remainder six scores and more. Non-dependent respondents (≤5 scores) accounted for 49.0%. For 32% of khat chewers the SDS scores (8 and above) suggests a severe level of dependence (Gossop et al., 1995).

The data set yielded correlation matrix of many coefficients of 0.3 and above as recommended by Tabachnick and Fidell (2001). The Kasier-Meyer-Olkin Measure of Sampling Adequacy value was .758, exceeding the recommended value of .6 (Kaiser, 1970, 1974). The Bartlett’s Test of Sphericity (1954), was statistically significant (.005), supporting the factorability of the correlation matrix.

A single-factor solution accounting for 52.33% of variance was obtained from factor analysis with principal components extraction of the five items comprising the SDS-khat, confirming the uni-dimensionality of the scale. Extraction of this factor was supported with the use of Catell’ (1966) scree plot test (Figure 4.1) which revealed a clear break after the first component.

Figure 4.1: Severity of Dependence scale, SDS-khat: Screeplot



The component matrix revealed that all the items loaded strongly (range 0.59-0.85) on this individual factor. The internal reliability of the SDS-khat was high (Cronbach's alpha coefficient=0.87) and the test re-test intraclass correlation coefficient (ICC) was 0.93.

Different aspects of khat chewing behaviours, including frequency, duration, and dose, (Table 4.5) were also used to validate SDS-khat. The results of simple logistic regression showed that these variables were found to be statistically significantly associated with self-reported khat dependence. SDS-khat dependent respondents were 14.40 (95%CI=6.71-30.90) times more likely to have higher scores (≥ 6 scores) of the composite index of khat chewing behaviour.

Table 4.5: Frequency distribution and results of simple logistic regression of self-reported khat dependence and khat chewing behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Khat chewing behaviours	Severity of dependence on khat (SDS-khat)					
	Non-dependent N (%)		Dependent N (%)		Unadjusted OR (95%CI)	P-value
Setting of khat chewing						
With others	94	(53.7)	81	(46.3)	1	
By yourself	6	(20.7)	23	(79.3)	4.45 (1.73-11.46)	0.001
Number of days chewing						
2 days or less	75	(68.8)	34	(31.2)	1	
3 days or more	25	(26.3)	70	(73.7)	6.18 (3.35-11.37)	0.001
Time starting chewing						
Between 3:00 pm and onward	64	(57.1)	48	(42.9)	1	
Between 1.00-3.00 pm	36	(39.1)	56	(60.9)	2.07 (1.83-3.64)	0.011
Khat chewed in session						
Up to 1 bundle	70	(66.7)	35	(33.3)	1	
1.25 bundle and more	30	(30.3)	69	(69.7)	4.60 (2.55-8.30)	0.001
12 prior months amount chewed						
From lowest to 1 bundle	71	(67.6)	34	(32.4)	1	
From 1.5 bundle to above	29	(29.3)	70	(70.7)	5.04 (2.78-9.14)	0.001
Chewed more in first hours						
No	63	(64.9)	34	(35.1)	1	
Yes	37	(34.6)	70	(65.4)	3.51 (1.97-6.24)	0.001
Khat chewing session hours						
Up to six hours	72	(49.0)	75	(51.0)	1	
More than 6 hours	28	(49.1)	29	(50.9)	0.99 (0.54-1.83)	0.985
Chewing even ill						
No	77	(61.6)	48	(38.4)	1	
Yes	23	(29.1)	56	(70.9)	3.91 (2.13-7.15)	0.001
Swallow khat juice						
No	9	(34.6)	17	(65.4)	1	
Yes	91	(51.1)	87	(48.9)	0.51 (0.21-1.19)	0.117
Whole week not chewing						
Very easy or fairly easy	91	(75.8)	29	(24.2)	1	
Fairly difficult or very difficult	9	(10.7)	75	(89.3)	26.15 (11.66-58.65)	0.001
Composite of khat behaviour						
Low	90	(69.2)	40	(30.8)	1	
High	10	(13.5)	64	(86.5)	14.40 (6.71-30.89)	0.001

4.3.6 Tobacco use

Forty five percent of respondents were regular tobacco smokers with an additional 20% respondents were episodic smoking respondents (ESR) and the remainder were never smokers.

Amongst the 91 regular cigarette smoker respondents, 66% started smoking in Yemen, 26% in the UK and 8% elsewhere (Appendix 10B, Table B.1). The mean age of initiation was 19 years (SD± 6.21) and the median 18 years (range10-40).

Amongst regular cigarette smokers, 26% started cigarette smoking between 10-15 years old, 39% between 16-19 years old and the remainder were 20 years and older (Appendix 10B, Table B.2).

Cigarettes were the primary tobacco product of 99% of regular tobacco users. One respondent chewed shamma (smokeless tobacco) and smoked cigarettes. The primary tobacco product used by ESR was cigarettes (60%), shisha (water pipe) (33%) and both cigarettes and shisha 7%.

Amongst regular cigarette smokers, in the past, 77% reported cigarette smoking, eight percent smoked shisha and traditional shisha (mada'a) and one percent chewed shamma (Appendix 10B, Table B.3). Twenty-nine percent of ESR had been in the past regular cigarette smokers, 33% shisha and traditional shisha (mada'a) smokers, 7% both shisha and cigarette smokers and shamma chewers 5% (Appendix 10 B, Table B.4).

Ninety three percent of regular cigarette smokers reported having a current close friend who also smoked cigarettes (Appendix 10B, Table B.5). However, when regular cigarette smokers were asked if their partner or wife smoked cigarettes, 70% reported negatively (Appendix 10B, Table B.6).

Sixty four percent of regular cigarette smokers' fathers and 10% of their mothers had also been regular cigarette smokers (Appendix 10B, Table B.7, 8). Nine percent and 11% fathers and mothers of regular cigarette smokers had used other forms of tobacco (Appendix 10B, Table B.9, 10). In total, 73% and 21% of this group's fathers and mothers had used different forms of tobacco (Appendix 10B, Table B.11, 12)

Eighty-six percent of regular cigarette smokers reported that they were ‘Much more likely to smoke cigarettes’ or ‘More likely to smoke cigarettes’ when chewing khat. The remainder reported either a decrease or no change in their cigarette smoking (Appendix 10B, Table B.13). The mean number of cigarettes smoked during a khat chewing session by regular cigarette smokers was 21.04 (SD± 13.36) and the median 20 cigarettes (range 4-80). The mean number of cigarettes smoked by ESR when chewing khat was 16.32 (SD ±10.15) and the median 15.00 cigarettes (range 5-40).

Twelve percent of the regular cigarette smokers reported smoking shisha during khat chewing. Amongst these, nine shared shisha and only two chewers used their own shisha. Amongst 14 episodic shisha smokers eleven smoked their own shisha and the remainder shared shisha.

Table 4.6 reports initiators to tobacco smoking, tobacco smoking behaviours during chewing and reason for smoking when chewing amongst regular cigarette smokers and ESR. Eighty two percent of regular cigarette smokers reported social (friends or family) as initiators, 11% environmental factors (khat chewing setting) and others (7%). Forty eight percent of ESR reported social initiators (friends), 45% environmental (khat chewing setting) and other initiators (7%).

Twenty six percent of regular cigarette smokers reported smoking up to ten cigarettes per khat chewing session, 46% 11-20 cigarettes and 28% 21 cigarettes or more. Amongst ESR 50% reported smoking up to ten cigarettes per khat chewing session, 39% 11-20 cigarettes and 11% 21 cigarettes or more.

Thirty nine percent of regular cigarette smokers reported an increase in their cigarette smoking compared to the previous 12 months. Whilst 45% of ESR reported that their tobacco smoking when chewing khat remained at the same level, twenty six percent reported an increase and 29% reported a decrease.

Forty percent of regular cigarette smokers reported smoking more during the first hours of the session and 66% of this group continued smoking after spitting khat. Forty one percent of ESR (whether cigarette or shisha smokers) reported more cigarette/shisha smoking during the first hours of khat chewing and 33% continued smoking after spitting khat.

Reasons for smoking during chewing sessions amongst both regular and ESR were investigated. Fifteen respondents reported smoking when chewing khat as part of their usual behaviour. However, the other 118 respondents offered an explanation related to the effect of khat and social setting such as ‘Improve impact of khat’ and ‘everybody smokes in khat chewing session’.

To validate self-reports of smoking, expired carbon monoxide (CO) was measured. The overall mean CO score for regular tobacco smokers was 20.53 pmm (SD± 12.12) and the median 18.00 pmm (range of 3-66). The overall CO mean score amongst ESR was 16 ppm (SD ±15.66) and the median 11 ppm (range 1-48).
Nine percent of regular tobacco smokers had CO scores of 5 or less. Thirty nine percent of ESR had CO scores of 5 or less (Appendix 10B, Table B.14, 15).

Carbon monoxide measures were taken during different times of the day amongst regular smokers and ESR (Appendix 10B, Table B.16, 17).

Table 4.6: Initiators of smoking, tobacco smoking behaviours during chewing and reason for smoking when chewing khat amongst regular cigarette smokers and episodic smoker respondents in a sample of UK resident adult male Yemeni khat chewers

Variables	Regular smokers respondents		Episodic smokers respondents (ESR)	
	N=91 N (%)		N=42 N (%)	
Initiators of tobacco smoking				
Social	75	(82.4)	20	(47.6)
Environmental	10	(11.0)	19	(45.2)
Others	6	(6.6)	3	(7.1)
	N=91 N (%)		N=28 N (%)	
Current number cigarettes^ smoked during chewing				
4-10 cigarettes	24	(26.4)	14	(50.0)
11-20 cigarettes	42	(46.2)	11	(39.3)
21 cigarettes or more	25	(27.5)	3	(10.7)
	N=90 N (%)		N=42 N (%)	
Current tobacco smoked during chewing compared to 12 months				
Increased	35	(38.9)	11	(26.2)
Decreased	19	(21.1)	12	(28.6)
Remained at the same level	36	(40.0)	19	(45.2)
	N=91 N (%)		N=42 N (%)	
Smoking more in first hours of chewing				
Yes	36	(39.6)	17	(40.5)
No	55	(60.4)	25	(59.5)
	N=91 N (%)		N=42 N (%)	
Continue smoking after spitting khat				
Yes	60	(65.9)	14	(33.3)
No	31	(34.1)	28	(66.7)
	N=76 N (%)		N=42 N (%)	
Reasons for smoking tobacco when chewing				
Improve impact of khat	49	(64.5)	29	(69.0)
Enhance taste of khat	12	(15.8)	3	(7.1)
Everybody smokes in khat chewing session	3	(3.9)	3	(7.1)
Other reasons e.g. cigarettes is tasty with khat	12	(15.8)	7	(16.7)

^ reported for ESR cigarette smokers or cigarette smokers and shisha smokers

Amongst regular cigarette smokers fifty two percent of these measures were taken during khat chewing. After adjustment of three CO outlying scores to the nearest score, the mean CO score when chewing khat amongst regular smokers was 24.28 ppm (SD ±9.99) and the median 22 ppm (range 7-44). The mean score of CO recorded during other times than chewing khat time was 15.39 ppm (SD ±9.09) and the median 14 ppm (range 3-44).

Amongst ESR (39) three scored were excluded. Of the 36 CO measures 21 were taken from respondents when chewing khat and the remainder (15) at other times. The mean score of CO for ESR in other times than chewing was 2.47ppm (SD±1.64) and the median 2 ppm (range 1-6). The mean score of CO for ESR during khat chewing was 25.84 ppm (SD±15.14) and the median 26 ppm (range 1-48)

Seventy three percent of regular cigarette smokers reported it 'Fairly difficult or Very difficult' to spend the whole day without smoking (Appendix 10B, Table B.18). A large percentage (84%) wanted to give up cigarette smoking. The desire to give up cigarettes smoking was reported as 'Quite or Very strong' by 78% (Appendix 10B, Table B.19).

Seventy six percent of regular cigarette smokers had tried to stop smoking. The mean number of attempts was 3.81 attempts (SD± 4.32) and the median 2 attempts (range 1-20). Seventy-three percent of ESR had tried to stop smoking tobacco when chewing khat. The mean number of their attempts was 2.77 attempts (SD ±1.94) and the median 2 attempts (range 1-10).

Table 4.7 shows a statistically significant ($p < 0.001$) difference in the CO mean rank scores measured during khat chewing and at other times than chewing amongst both regular cigarette smokers and ESR. The effect size was calculated as medium ($r=-0.44$) for regular cigarette smokers and as high ($r=-0.78$) for ESR.

Table 4.7: Mean rank of CO score for regular cigarette smokers and ESR at other times and when chewing khat in a sample of UK resident adult male Yemeni khat chewers

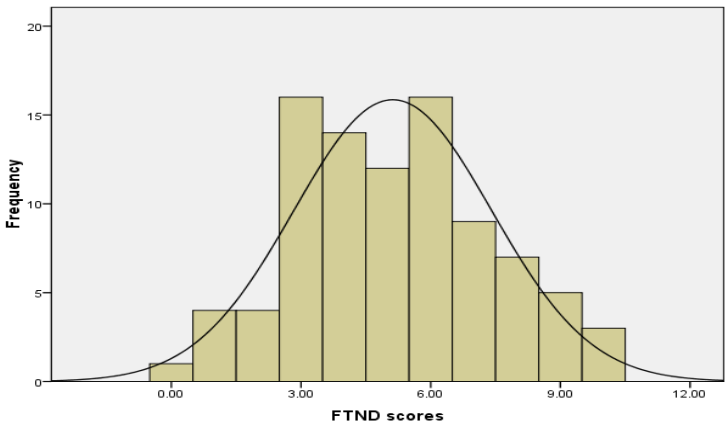
Times of measuring CO	Number	Mean Rank	Sum of Ranks
Amongst regular cigarette smokers (n=91)			
Other times than chewing	44	34.18	1504.50
During khat chewing time	47	57.06	2682.00
Amongst episodic smoker respondents (n=36)			
Other times than chewing	15	8.80	132.00
During khat chewing	21	25.43	534.00

Finally, the 6 items of FTND were used to assess nicotine dependence amongst regular cigarette smokers (Appendix 6C, 6D, Section 6.1.1 Q1-6). The mean FTND score was 5.12 (SD±2.29) with a median of 5.00 score (range 0-10). The frequency distribution of FTND is presented in Figure 4.2. Ten percent of regular cigarette smokers had very low nicotine dependence, 33% low nicotine dependence, 13% medium nicotine dependence, 27.5% high nicotine dependence and 16.5% very high nicotine dependence (Table 4.8).

Table 4.8: Levels of nicotine dependence (FTND) amongst regular cigarette smokers in a sample of UK resident adult male Yemeni khat chewers (n=91)

Levels of nicotine dependence	N	(%)
Very low nicotine dependence (0-2 scores)	9	(9.9)
Low nicotine dependence (3-4 scores)	30	(33.0)
Medium nicotine dependence (5 scores)	12	(13.1)
High nicotine dependence (6-7 scores))	25	(27.5)
Very high nicotine dependence (8-10 scores)	15	(16.5)

Figure 4.2: Histogram of the distribution of FTND scores (n=91)



4.3.7 Summary of sample description

First, the demographic and socio-cultural characteristics showed that:

1. The mean age of the study sample was 44.84 years (SD±19.70).
2. Ninety percent of respondents had either a social or private housing tenancy.
3. Sixty five percent of respondents were unemployed.
4. Sixty six percent of respondents had completed a low level of education.
5. Social participation in own community is higher.
6. Forty seven percent of the sample reported being born in villages cultivating khat in Yemen.
7. Fifty eight percent preferred reading in 'Arabic or Other' languages and amongst respondents living with others 78% speaking at home in 'Arabic'.

Second, the health outcomes and related behaviours were:

1. Forty percent of respondents self-rated 'compromised' health.
2. Thirty eight percent of respondents self-reported health conditions.
3. Thirty two percent of respondents were not registered with a dentist.
4. Sixty two percent of respondents would never go to dentist or only when in pain.
5. Twenty nine percent of respondents self-reported oral problems.

Third, aspects of khat chewing were:

1. The mean age of initiation of khat chewing was 18 years (SD±5.48).
2. Seventy nine percent started khat chewing in Yemen.
3. Eighty percent of respondents' fathers were khat chewers.
4. Ninety four percent of respondents' friends chewing khat.
5. Forty three percent of respondents were living with khat chewers.
6. Social interaction was reported by 48% as the main reason for chewing khat.

7. Fifty three percent had not received education or information about khat's impact.
8. Fifty one percent of respondents reported dependence on khat.
9. The Validity of the SDS-khat scale as a measure of khat dependence was demonstrated.

Finally, tobacco use amongst respondents was:

1. Sixty five percent of this study sample smoked tobacco either regularly or episodically.
2. Forty four percent of 91 regular tobacco smokers had high nicotine dependence.
3. Of all smokers, 22% were introduced to tobacco smoking by the khat chewing setting.
4. There was a higher score of CO during khat chewing and a significant association between high CO score and time of chewing amongst both regular and episodic smoker respondents.
5. Large percentages (65% and 69%) of regular and episodic smoker respondents perceived smoking as an element for improving the impact of khat during a chewing session.

4.4 Phase II: Health outcomes with the explanatory variables

This section describes the effect of a set of explanatory variables on the following health outcomes:

1. Self-rated ‘compromised’ health;
2. Self-reported oral problems;
3. Self-reported health conditions;
4. Self-reported ‘high’ nicotine dependence.

4.4.1 Self-rated ‘compromised’ health

The results of simple logistic regression between explanatory variables, namely, demographic and socio-cultural, psychosocial and behavioural variables with self-rated ‘compromised’ health are described under this section.

Table 4.9 shows that being older, with low level of completed education, unemployed or living in an uncrowded housing were found to be significantly associated with self-rating ‘compromised’ health. Acculturation variables, namely, preferred reading in Arabic and starting chewing in Yemen, were found to be risk factors among chewers self-rating ‘compromised’ health (OR=3.01, 95%CI=1.65-5.51; OR= 2.30, 95%CI =1.08-4.87). Respondents with a short period of residency in the UK were less likely to self-rate ‘compromised’ health (OR=0.26, 95%CI=0.14-0.47). In addition, currently living with other chewers, being married and with a large family size was found to be statistically significantly associated with self-rated ‘compromised’ health. Other variables did not show a statistically significant association.

Table 4.9: Frequency distribution and results of simple logistic regression of demographic and socio-cultural variables and self-rated health in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic and socio-cultural variables	Self-rated health					
	Uncompromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	P-value
Age						
18-40 years	86	(83.5)	17	(16.5)	1	
41 years and older	36	(35.6)	65	(64.4)	9.13 (4.71-17.68)	0.001
Residency post code						
Sheffield 5 or 6 and other	35	(63.6)	20	(36.4)	1	
Sheffield S3 or S4	87	(58.4)	62	(41.6)	1.25 (0.66-2.36)	0.498
Level of education						
High education	54	(77.1)	16	(22.9)	1	
Low education	68	(50.7)	66	(49.3)	3.28 (1.71-6.29)	0.001
Employment status						
Employed	65	(90.3)	7	(9.7)	1	
Unemployed	57	(43.2)	75	(56.8)	12.22 (5.21- 28.65)	0.001
Home ownership						
Own it	11	(52.4)	10	(47.6)	1	
Rent it	111	(60.7)	72	(39.3)	o.71 (0.28-1.77)	0.464
Crowding index^						
Overcrowded	67	(80.7)	16	(19.3)	1	
Uncrowded	54	(45.0)	66	(55.0)	5.12 (2.66-9.84)	0.001
Country of birth						
UK & other	22	(64.7)	12	(35.3)	1	
Yemen	100	(58.8)	70	(41.2)	1.28 (0.60-2.76)	0.524
City of birth						
Elsewhere	70	(64.2)	39	(35.8)	1	
Yemen khat village	52	(54.7)	43	(45.3)	1.48 (0.85-2.61)	0.169
UK Residency						
Long	45	(44.1)	57	(55.9)	1	
Short	77	(75.5)	25	(24.5)	0.26 (0.14-0.47)	0.001
Language of reading						
English, English & Arabic	64	(74.4)	22	(25.6)	1	
Arabic and other	58	(49.2)	60	(50.8)	3.01(1.65-5.51)	0.001
Initiators of khat chewing						
Other	14	(63.6)	8	(36.4)	1	
Family	44	(62.0)	27	(38.0)	0.64 (0.23-1.77)	0.388
Close friend	64	(57.7)	47	(42.3)	0.74 (0.28-1.93)	0.539
Place started chewing						
UK and elsewhere	32	(74.4)	11	(25.6)	1	
Yemen	90	(55.9)	71	(44.1)	2.30 (1.08-4.87)	0.030
Father chewing khat						
No	22	(55.0)	18	(45.0)	1	
Yes	100	(61.0)	64	(39.0)	0.78 (0.39-1.57)	0.490
Mother chewing khat						
No	103	(62.4)	62	(45.0)	1	
Yes	19	(48.7)	20	(39.0)	0.12 (0.87-3.53)	0.119
Living with other chewer						
No	78	(66.7)	39	(33.3)	1	
Yes	44	(50.6)	43	(49.4)	1.96 (1.11-3.46)	0.021
Close friend chewing khat						
No	5	(38.5)	8	(61.5)	1	
Yes	117	(61.3)	74	(38.7)	0.40 (0.13-1.25)	0.115
Marital status						
Married	88	(56.4)	68	(43.6)	1	
Other marital status	34	(70.8)	14	(29.2)	0.53 (0.27-1.07)	0.077
Family size						
Small	82	(70.1)	35	(29.9)	1	
Large	40	(46.0)	47	(54.0)	2.75 (1.54-4.91)	0.001

^ One response missing

The relationship of self-rated health with the psychosocial explanatory variables in Table 4.10 shows that khat dependent respondents were more likely to self-rate 'compromised' health than non khat dependent respondents (OR=3.32, 95%CI=1.84-5.99). The difference in self-rating 'compromised' health between dependent (53.8%) and non-dependent (26%) respondents was statistically significant (p=0.001). In addition, respondents reporting low social participation were more likely to self-rate 'compromised' health than these respondents reporting high social participation (OR=3.52, 95%CI=1.94-6.37). The difference in self-rating 'compromised' health between respondents having high social participation (25.3%) and low social participation (54.3%) was statistically significant (p=0.001).

Table 4.10: Frequency distribution and results of simple logistic regression of psychosocial variables and self-rated health in a sample of UK resident adult male Yemeni khat chewers (n=204)

Psychosocial Variables	Self-rated health					
	Uncompromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	P-value
Khat dependence						
Non-dependent	74	(74.0)	26	(26.0)	1	
Dependent	48	(46.2)	56	(53.8)	3.32 (1.84-5.99)	0.001
Social participation						
High	74	(74.7)	25	(25.3)	1	
Low	48	(45.7)	57	(54.3)	3.52 (1.94-6.37)	0.001

Many khat chewing behaviours showed a significant association with self-rated 'compromised' health (Appendix 10D, Table 1).

Table 4.11 shows that respondents with higher composite index of khat chewing behaviour scores were more likely to self-rate 'compromised' health than respondents with lower scores (OR = 3.55; 95%CI =1.95-6.46).

Episodic smoker respondents (ESR) were found also to be less likely to self-rate 'compromised' health compared with non smoking respondents (OR =0.49; 95%CI = (0.22-1.09).

Table 4.11: Frequency distribution and results of simple logistic regression of self-rated health and composite of khat behaviour and tobacco smoking in a sample of UK resident adult male Yemeni khat chewers (n=204)

Khat chewing and smoking behavioural variables	Self-rated health					
	Uncompromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	P-value
Composite khat behaviour						
Low	92	(70.8)	38	(29.2)	1	
High	30	(40.5)	44	(59.5)	3.55 (1.95-6.46)	0.001
Tobacco smoking						
Non smoker respondents	37	(52.1)	34	(47.9)	1	
Episodic smoker respondents	29	(69.0)	13	(31.0)	0.49 (0.22-1.09)	0.080
Regular smoker respondents	56	(61.5)	35	(38.5)	0.68 (0.36-1.28)	0.229

To summarise, the following explanatory variables showed statistically significant associations with self-rated 'compromised' health:

1. **Demographic and socio-cultural explanatory variables:** age, employment, level of education, crowding index, living with other chewer, marital status, family size, period of residency, language preferred for reading and place of starting chewing.
2. **Psychosocial explanatory variables:** severity of dependence on khat (SDS-khat) and social participation.
3. **Behavioural variables:** many khat chewing behaviours showed a significant association with self-rated 'compromised' health as well as the composite index of khat chewing behaviour and tobacco smoking.

The following variables (Table 4.12) were selected for inclusion to enter into the multiple regression models (Chapter 3, Section 3.10). However, pairwise correlations between explanatory variables showed that composite index of khat

behaviour and SDS-khat were moderately correlated (rho= 0.54). As both variables were conceptually important it was decided to test the model with both variables and then with each one separately.

Table 4.12: Summary of frequency distribution and results of simple logistic regression of self-rated health with selected explanatory variables in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic, socio-cultural, psychosocial and behavioural explanatory variables	Self-rated health					
	Uncompromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	P-value
Demographic and socio-cultural distal explanatory variables						
Age						
18-40 years	86	(83.5)	17	(16.5)	1	
41 years and older	36	(35.6)	65	(64.4)	9.13 (4.71-17.68)	0.001
Employment status						
Employed	65	(90.3)	7	(9.7)	1	
Unemployed	57	(43.2)	75	(56.8)	12.22 (5.21-28.65)	0.001
Level of education						
High education	54	(77.1)	16	(22.9)	1	
Low education	68	(50.7)	66	(49.3)	3.28 (1.71-6.29)	0.001
Crowding index^						
Overcrowded	67	(80.7)	16	(19.3)	1	
Uncrowded	54	(45.0)	66	(55.0)	5.12 (2.66-9.84)	0.001
Marital status						
Married	88	56.4)	68	(43.6)	1	
Other marital status	34	(70.8)	14	(29.2)	0.53 (0.27-1.07)	0.077
Family size						
Small	82	(70.1)	35	(29.9)	1	
Large	40	(46.0)	47	(54.0)	2.75 (1.54-4.91)	0.001
Living with other chewer						
No	78	(66.7)	39	(33.3)	1	
Yes	44	(50.6)	43	(49.4)	1.96 (1.11-3.46)	0.021
UK Residency						
Long residency	45	(44.1)	57	(55.9)	1	
Short residency	77	(75.5)	25	(24.5)	0.26 (0.14-0.47)	0.001
Language of reading						
English, English & Arabic	64	(74.4)	22	(25.6)	1	
Arabic and other	58	(49.2)	60	(50.8)	3.01 (1.65-5.51)	0.001
Place started chewing						
UK and elsewhere	32	(74.4)	11	(25.6)	1	
Yemen	90	(55.9)	71	(44.1)	2.30 (1.08-4.87)	0.030
Psychosocial intermediate explanatory variables						
Social participation						
High	74	74.7)	25	(25.3)	1	
Low	48	(45.7)	57	(54.3)	3.52 (1.94-6.37)	0.001
Khat dependence						
Non-dependent	74	(74.0)	26	(26.0)	1	
Dependent	48	(46.2)	56	(53.8)	3.32 (1.84-5.99)	0.001
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	92	(70.8)	38	(29.2)	1	
High	30	(40.5)	44	(59.5)	3.55 (1.95-6.46)	0.001
Tobacco smoking						
Non smoker respondents	37	(52.1)	34	(47.9)	1	
Episodic smoker respondents	29	(69.0)	13	(31.0)	0.49 (0.22-1.09)	0.080
Regular smoker respondents	56	(61.5)	35	(38.5)	0.68 (0.36-1.28)	0.229

^ One response missing

The final model of self rated health as dependent variable both unadjusted and adjusted with demographic, socio-cultural, psychosocial and behavioural variables, is presented in Table 4.13. The process of developing this final model alongside further modelling is described in Appendix 10F. Older and unemployed respondents who lived in uncrowded housing and had low social participation were more likely to rate their health as ‘compromised’. Other variables in the model were not found to associate with self-rated ‘compromised’ health.

Adjusting the model to include tobacco smoking behaviour alongside the composite index of khat chewing behaviour made a poor contribution to the model’s goodness of fit and it was omitted. Omitting the the insignificant explanatory variables from the final model confirmed the significance of earlier variables identified as associated with self-rated ‘compromised’ health.

The results of the final hierarchical model displayed a model chi- square at 99.40 (df=13, $p<0.001$), the correct percentage classified was 82.8% of cases and a Hosmer-Lemeshow Goodness of fit at 9.05 (df=8, $p=0.338$). The model as a whole explained between 38.7% (Cox & Snell R Square) and 52.3% (Nagelkerke R Square) of the variance of self-rated ‘compromised’ health.

Finally, covariance between correlates of self-rated ‘compromised’ health namely, employment status, social participation and crowding index was tested and presented in Table 1, Appendix 10E.

In summary, a hierarchical logistic regression analysis between selected explanatory variables and self-rated health was performed to assess the impacts

of a number of these variables on the likelihood that respondents would rate their health as ‘compromised’. At the final model four selected distal explanatory variables made statistically significant contributions to the model. These were age, employment, crowding index and level of social participation. These explanatory variables remained significantly associated with self-rated ‘compromised’ health even when the model was tested with both variables of composite index of khat chewing behaviour and SDS-khat or with each one separately.

Table 4.13: Final regression model of self-rated 'compromised' health and explanatory variables (n=204)

Explanatory variables	Un-compromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Age						
18-40 years	86	(83.5)	17	(16.5)	1	1
41 years and older	36	(35.6)	65	(64.4	9.13 (4.71-17.68)***	4.47 (1.46-13.66)***
Employment						
Employed	65	(90.3)	7	(9.7)	1	1
Unemployed	57	(43.2)	75	(56.8)	12.22 (5.21-28.65) ***	5.49 (1.89-15.96)***
Education Level						
High education	54	(77.1)	16	(22.9)	1	1
Low education	68	(50.7)	66	(49.3)	3.28 (1.71-6.29) ***	1.30 (0.53-3.21)
Crowding index ^						
Overcrowded	67	(80.7)	16	(19.3)	1	1
Uncrowded	54	(45.0)	66	(55.0)	5.12 (2.66-9.84)***	2.65 (1.13-6.22)**
Marital status						
Married	88	(56.4)	68	(43.6)	1	1
Other marital status	34	(70.8)	14	(29.2)	0.53(0.27-1.07)*	0.96 (0.31-3.02)
Family size						
Small	82	(70.1)	35	(29.9)	1	1
Large	40	(46.0)	47	(54.0)	2.75 (1.54-4.91)***	0.58 (0.21-1.62)
Living with chewer						
No	78	(66.7)	39	(33.3)	1	1
Yes	44	(50.6)	43	(49.4)	1.96 (1.11-3.46) **	1.36 (0.61-3.06)
UK Residency						
Long	45	(44.1)	57	(55.9)	1	1
Short	77	(75.5)	25	(24.5)	0.26 (0.14-0.47)***	0.55 (0.23-1.30)
Reading language						
English, English & Arabic	64	(74.4)	22	(25.6)	1	1
Arabic and other	58	(49.2)	60	(50.8)	3.01 (1.65-5.51) ***	1.00 (0.40-2.47)
Place started chewing						
UK and elsewhere	32	(74.4)	11	(25.6)	1	1
Yemen	90	(55.9)	71	(44.1)	2.30 (1.08-4.87) **	0.81(0.28-2.36)
Psychosocial intermediate explanatory variables						
Social participation						
High	74	(74.7)	25	(25.3)	1	1
Low	48	(45.7)	57	(54.3)	3.52 (1.94-6.37) ***	2.61(1.22-5.61)**
Khat dependence						
Non-dependent	74	(74.0)	26	(26.0)	1	1
Dependent	48	(46.2)	56	(53.8)	3.32 (1.84-5.99) ***	1.20 (0.48-3.05)
Behavioural proximal explanatory variables						
Composite khat behavior						
Low	92	(70.8)	38	(29.2)	1	1
High	30	(40.5)	44	(59.5)	3.55 (1.95-6.46)***	1.75 (0.69-4.42)

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

4.4.2 Self-reported oral problems

The results of the simple logistic regression between explanatory variables, namely, demographic and socio-cultural, psychosocial and behavioural variables with self-reported oral problems are described under this section.

Table 4.14 shows that older unemployed respondents with low level of completed education and living in uncrowded housing were more likely to self-report oral problems. These variables were found to be significantly associated with self-reported oral problems. In addition, respondents who reported their mothers were also khat chewers and respondents with a large family size were 1.91 (95%CI=0.92-3.95) and 1.85 (95%CI=1.01-3.40) times more likely to self-report oral problems.

Two variables related to the acculturation of respondents showed significant association with self-reported oral problems. Respondents who preferred reading in ‘Arabic and other’ and who started khat chewing in ‘Yemen’ were more likely to self-report oral problems (OR=2.60, 95%CI=1.35-5.03; OR=2.52, 95%CI=1.05-6.05).

The contribution of psychosocial explanatory variables to self-reported oral problems (Table 4.15) was that respondents with khat dependence and low social participation were more likely to self-report oral problems.

Table 4.14: Frequency distribution and results of simple logistic regression of socio-cultural variables and self-reported oral problems in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic and socio-cultural variables	Self-reported oral problems					
	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Age						
18-40 years	82	(79.6)	21	(20.4)	1	
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)	0.005
Residency post code						
S5+S6+ other	40	(72.2)	15	(27.3)	1	
S3+S4	104	(69.8)	45	(30.2)	1.15 (0.58-2.30)	0.648
Level of education						
High education	59	(84.3)	11	(15.7)	1	
Low education	85	(63.4)	49	(36.6)	3.09 (1.49-6.44)	0.003
Employment status						
Employed	60	(83.3)	12	(16.7)	1	
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)	0.003
Homeownership						
Own it	16	(76.2)	5	(23.8)	1	
Rent it	128	(69.9)	55	(30.1)	1.38 (0.48-3.94)	0.553
Crowding index^						
Overcrowded	64	(77.1)	19	(22.9)	1	
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)	0.085
Country of birth						
Uk & other	28	(82.4)	6	(17.6)	1	
Yemen	116	(68.2)	54	(31.8)	2.17(0.85-5.56)	0.105
City of birth						
Elsewhere	79	(72.5)	30	(27.5)	1	
Yemen khat village	65	(68.4)	30	(31.6)	1.22 (0.67-2.22)	0.526
UK Residency						
Long	71	(69.6)	31	(30.4)	1	
Short	73	(71.6)	29	(28.4)	0.91(0.50-1.66)	0.759
Language of reading						
English, English& Arabic	70	(81.4)	16	(18.6)	1	
Arabic and other	74	(62.7)	44	(37.3)	2.60 (1.35-5.03)	0.004
Initiators of khat chewing						
Other	14	(63.6)	8	(36.4)	1	
Family	52	(73.2)	19	(26.8)	0.64 (0.23-1.77)	0.388
Close friend	78	(70.3)	33	(29.7)	0.74 (0.28-1.93)	0.539
Place started chewing						
UK and other places	36	(83.7)	7	(16.3)	1	
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)	0.038
Father chewing khat						
No	28	(70.0)	12	(30.0)	1	
Yes	116	(70.7)	48	(29.3)	0.97 (0.45-2.06)	0.927
Mother chewing khat						
No	121	(73.3)	44	(26.7)	1	
Yes	23	(59.0)	16	(41.0)	1.91(0.93-3.95)	0.080
Living with chewer						
No	86	(73.5)	31	(26.5)	1	
Yes	58	(66.7)	29	(33.3)	1.39 (0.76-2.54)	0.290
Marital status						
Other marital status	33	(68.8)	15	(31.3)	1	
Married	111	(71.2)	45	(28.8)	0.89 (0.44-1.80)	0.749
Family size						
Small	89	(76.1)	28	(23.9)	1	
Large	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)	0.048

^ One response missing

Table 4.15: Frequency distribution and results of simple logistic regression of psychosocial variables and self-reported oral problems in a sample of UK resident adult male Yemeni khat chewers (n=204)

Psychosocial variables	Self-reported oral problems					
	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Khat dependence						
Non-dependent	80	(80.0)	20	(20.0)	1	
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)	0.004
Social participation						
High	76	(76.8)	23	(23.2)	1	
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.33)	0.061

The relationship of self-reported oral problems with khat chewing behaviours showed that six out of ten khat chewing behaviours were insignificantly associated with self-reported oral problems (Appendix 10D, Table 2). The composite index of khat chewing behaviour and tobacco smoking behaviours were found to be insignificantly associated with self-reported oral problems (Table 4.16).

Table 4.16: Frequency distribution and results of simple logistic regression of self-reported oral problems and composite of khat behaviour and tobacco smoking in a sample of UK resident adult male Yemeni khat chewers (n=204)

Behavioural variables	Self-reported oral problems					
	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Composite khat behaviour						
Low	96	(73.8)	34	(26.2)	1	
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.84)	0.177
Tobacco smoking						
Non smoker respondents	51	(71.8)	20	(28.2)	1	
Episodic smoker respondents	29	(69.0)	13	(31.0)	1.14 (0.50-2.63)	0.753
Regular smoker respondents	64	(70.3)	27	(29.7)	1.08 (0.54-2.14)	0.835

As far as the relationship between self-reported oral problems and oral health related behaviours was concerned, pattern of dental attendance and self-reported oral problems was found to be statistically significantly associated. Respondents who visited the dentist when in pain were 2.22 (95%CI=1.13-4.36) times more likely to self-report oral problems (Table 4.17).

Table 4.17: Frequency distribution and results of simple logistic regression of self-reported oral problems and related behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Oral health related behaviour variables	Self-reported oral problems					
	No oral problem N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Pattern of dental attendance						
For regular or occasional check	60	(76.9)	18	(23.1)	1	
In pain	54	(60.0)	36	(40.0)	2.22 (1.13-4.36)	0.020
Never been to the dentist	30	(83.3)	6	(16.7)	0.67 (0.24-1.85)	0.437

In summary, the following variables showed statistically significant associations with self-reported oral problems:

1. **Demographic and socio-cultural explanatory variables:** age, employment, level of education, crowding variable, family size, mother chewing, khat place starting khat chewing and language preferred for reading.
2. **Psychosocial explanatory variables:** Severity of dependence on khat (SDS-khat) and social participation.
3. **Behavioural variables:** pattern of dental attendance and four out of ten khat chewing behaviours showed association with self-report oral problems.

These variables were entered into the multivariate model. The composite index of khat behaviour was entered into the model to avoid over adjusting the model to individual khat behaviour variables. Tobacco smoking as well was entered (Table 4.18).

Table 4.18: Summary of frequency distribution and results of simple logistic regression of self-reported oral problems with selected explanatory variables in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic, socio-cultural, psychosocial and behavioural explanatory variables	Self-reported oral problems					
	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Demographic and socio-culture distal explanatory variables						
Age						
18-40 years	82	(79.6)	21	(20.4)	1	
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)	0.005
Employment status						
Employed	60	(83.3)	12	(16.7)	1	
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)	0.003
Level of education						
High education	59	(84.3)	49	(15.7)	1	
Low education	85	(63.4)	11	(36.6)	3.09 (1.49-6.44)	0.003
Crowding index^						
Overcrowded	64	(77.1)	19	(22.9)	1	
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)	0.085
Mother chewing khat						
No	121	(73.3)	44	(26.7)	1	
Yes	23	(59.0)	16	(41.0)	1.91 (0.92-3.95)	0.080
Family size						
Small	89	(76.1)	28	(23.9)	1	
Large	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)	0.048
Place started chewing						
UK and elsewhere	36	(83.7)	7	(16.3)	1	
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)	0.038
Language of reading						
English, English & Arabic	70	(81.4)	16	(18.6)	1	
Arabic and other	74	(62.7)	44	(37.3)	2.60 (1.35-5.03)	0.004
Psychosocial intermediate explanatory variables						
Khat dependence						
Non-dependent	80	(80.0)	20	(20.0)	1	
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)	0.004
Social participation						
High	76	(76.8)	23	(23.2)	1	
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.35)	0.061
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	96	(73.8)	34	(26.2)	1	
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.83)	0.177
Tobacco smoking						
Non smoker respondents	51	(71.8)	20	(28.2)	1	
Episodic smoker respondents	29	(69.0)	13	(31.0)	1.14 (0.50-2.63)	0.753
Regular smoker respondents	64	(70.3)	27	(29.7)	1.08 (0.54-2.14)	0.835
Dental attendance						
For regular or occasional check	60	(76.9)	18	(23.1)	1	
In pain	54	(60.0)	36	(40.0)	2.22 (1.13-4.36)	0.020
Never been to the dentist	30	(83.3)	6	(16.7)	0.67 (0.24-1.85)	0.437

^One response missing

The final model of self reported oral problems as dependent variable both unadjusted and adjusted with demographic, socio-cultural, psychosocial and behavioural variables, is presented in Table 4.19. The process of developing this final model alongside further modeling is described in Appendix 10F. Only low level of completed education was found significantly associated with self-reported oral problems. A low level of completed education increased the risk of self-reported oral problems by 2.27 (95%CI=1.02 -5.04) times.

The results of the hierarchical model displayed a model chi- square at 24.33 (df=10, $p<0.007$), the correct percentage classified was 68.5% of cases and a Hosmer-Lemeshow Goodness of fit at 5.11 (df=8, p=0.745). The model as a whole explained between11.3% (Cox & Snell R Square) and 16.1% (Nagelkerke R Square) of the variance of self-reported oral problems.

In summary: a hierarchical logistic regression analysis between selected explanatory variables and self-reported oral problems was performed to assess the impacts of these variables on the likelihood that respondents would self-report oral problems. As shown in Table 4.19 one distal explanatory variable (level of completed education) made a unique statistically significant contribution to the final model.

Table 4.19: Final regression model of self reported oral problems and explanatory variables (n=204)

Explanatory variables	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Age						
18-40 years	82	(79.6)	21	(20.4)	1	1
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)***	1.31 (0.54-3.19)
Employment status						
Employed	60	(83.3)	12	(16.7)	1	1
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)***	1.47 (0.60-3.61)
Level of education						
High education	59	(84.3)	11	(15.7)	1	1
Low education	85	(63.4)	49	(36.6)	3.09 (1.49-6.44)***	2.27 (1.02-5.04) **
Crowding index^						
Overcrowded	64	(77.1)	19	(22.9)	1	1
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)*	1.21 (0.59-2.49)
Family size						
0-3 children	89	(76.1)	28	(23.9)	1	1
4 children and more	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)**	0.97 (0.43-2.18)
Mother chewing khat						
No	121	(73.3)	44	(26.7)	1	1
Yes	23	(59.0)	16	(41.0)	1.91(0.93-3.95)*	1.71 (0.77-3.79)
Place started chewing						
UK and elsewhere	36	(83.7)	7	(16.3)	1	1
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)**	1.55 (0.58-4.08)
Psychosocial intermediate explanatory variables						
Social participation						
High	76	(76.8)	23	(23.2)	1	1
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.33)*	1.41 (0.71-2.77)
Khat dependence						
Non-dependent	80	(80.0)	20	(20.0)	1	1
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)***	1.85 (0.84-4.05)
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	96	(73.8)	34	(26.2)	1	1
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.84)	0.70 (0.32-1.56)

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

4.4.3 Self-reported health conditions

The results of the simple logistic regression between the explanatory variables, namely, demographic, socio-cultural, psychosocial and behavioural variables with self-reported health conditions are described under this section.

Table 4.20 shows the relationship of self-reported health conditions with demographic and socio-cultural variables. Older unemployed respondents, with low level of completed education and living in uncrowded housing were more likely to self-report health conditions. These variables were significantly associated with self-reported health conditions. In addition, respondents' mothers who chewed khat, with large family and living with a chewer were 1.94 (95%CI=0.99-4.03), 3.41(95%CI=1.89-6.16) and 2.01 (95%CI=1.13-3.57) times more likely to self-report health conditions.

Four variables related to respondents' acculturation showed a significant association with self-reported health conditions. Respondents, who preferred reading in Arabic, were born in Yemen and in khat growing villages were more likely to self-report health conditions (OR=2.80, 95%CI=1.52-5.15; OR=2.22, 95%CI=0.95-5.19; OR=1.99, 95%CI=1.11-3.53, respectively). However, a short UK residency was found to be protective from self-reporting a health conditions (OR=0.21, 95%CI= 0.12-0.40) (Table 4. 20).

Table 4.20: Frequency distribution and results of simple logistic regression of demographic and socio-cultural variables and self-reported health conditions in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic and socio-cultural Variables	Self-reported health conditions					
	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	P-value
Age						
18-40 years	86	(83.5)	17	(16.5)	1	
41 years and older	41	(40.6)	60	(59.4)	7.40 (3.85-14.25)	0.001
Residency post code						
Sheffield 5 or 6 and other	37	(67.3)	18	(32.7)	1	
Sheffield S3 or S4	90	(60.4)	59	(39.6)	1.35 (0.70-2.59)	0.370
Level of education						
High education	54	(77.1)	16	(22.9)	1	
Low education	73	(54.5)	61	(45.5)	2.82 (1.47-5.42)	0.002
Employment status						
Employed	65	(90.3)	7	(9.7)	1	
Unemployed	62	(47.0)	70	(53.0)	10.48 (4.48-24.56)	0.001
Homeownership						
Own it	12	(57.1)	9	(42.9)	1	
Rent it	115	(62.8)	68	(37.2)	0.79 (0.32-1.97)	0.610
Crowding index^						
Overcrowded	68	(81.90)	15	(18.1)	1	
Uncrowded	58	(48.3)	62	(51.7)	4.84 (2.50-9.41)	0.001
Father chewing khat						
No	21	(52.5)	19	(47.5)	1	
Yes	106	(64.6)	58	(35.4)	0.61(0.30-1.22)	0.158
Mother chewing khat						
No	108	(65.5)	57	(34.5)	1	
Yes	19	(48.7)	20	(51.3)	1.94 (0.99-4.03)	0.055
Living with chewer						
No	81	(69.2)	36	(30.8)	1	
Yes	46	(52.9)	41	(47.1)	2.01 (1.13-3.57)	0.018
Family size						
Small	87	(74.4)	30	(25.6)	1	
Large	40	(46.0)	47	(54.0)	3.41(1.89-6.16)	0.001
Country of birth						
Uk & other	26	(75.6)	8	(23.5)	1	
Yemen	101	(59.4)	69	(40.6)	2.22 (0.95-5.19)	0.066
City of birth						
Elsewhere	76	(69.7)	33	(30.3)	1	
Yemen khat village	51	(53.7)	44	(46.3)	1.99 (1.11-3.53)	0.019
UK Residency						
Long	46	(45.1)	56	(54.9)	1	
Short	81	(79.4)	21	(20.6)	0.21 (0.12-0.40)	0.001
Language of reading						
English, English & Arabic	65	(75.6)	21	(24.4)	1	
Arabic and other	62	(52.5)	56	(47.5)	2.80 (1.52-5.15)	0.001
Initiators of chewing						
Other	13	(59.1)	9	(40.9)	1	
Family	49	(69.0)	22	(31.0)	0.65 (0.24-1.74)	0.390
Close friend	65	(58.6)	46	(41.4)	1.02 (0.40-2.59)	0.963
Place started chewing						
UK and elsewhere	31	(72.1)	12	(27.9)	1	
Yemen	96	(59.6)	65	(40.4)	1.74 (0.84-3.66)	0.137

^ One response missing

The relationship of self-reported health conditions with psychosocial variables (Table 4.21) showed that respondents with khat dependence and low social participation were more likely to self-report health conditions (OR=3.29, 95%CI= 1.81-5.55; OR=2.90, 95%CI= 1.61-5.26 respectively).

Table 4.21: Frequency distribution and results of simple logistic regression of psychosocial and self-reported health conditions in a sample of UK resident adult male Yemeni khat chewers (n=204)

Psychosocial variables	Self-reported health conditions					
	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	P-value
Khat dependence						
Non-dependent	75	(76.0)	24	(24.0)	1	
Dependent	51	(49.0)	53	(51.0)	3.29 (1.81-5.55)	0.001
Social participation						
High	74	(74.7)	25	(25.3)	1	
Low	53	(50.5)	52	(49.5)	2.90 (1.61-5.26)	0.001

The results of a simple regression of the relationship of proximal behavioural variables with self-reported health conditions showed that many khat chewing behaviours were found to be statistically significantly associated with self-reported health conditions (Appendix 10D, Table 3). In addition, the composite index of khat chewing behaviour demonstrated a significant association with self-reported health conditions (OR=2.96, 95%CI=1.63-5.36) (Table 4.22). As for tobacco smoking behaviour, both regular and episodic smokers were less likely to self-report health conditions (OR =0.39, 95%CI =0.17-0.88; OR= 0.46, 95%CI = 0.24-0.86) (Table 4.22).

Table 4.22: Frequency distribution and results of simple logistic regression of self-reported health conditions and composite khat behaviour and tobacco smoking in a sample of UK resident adult male Yemeni khat chewers (n=204)

Behavioural variables	Self-reported health conditions					
	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	P-value
Composite khat behaviour						
Low	93	(71.5)	37	(28.5)	1	
High	34	(45.9)	40	(54.1)	2.96 (1.63-5.36)	0.001
Tobacco smoking						
Non smoker respondents	35	(49.3)	36	(50.7)	1	
Episodic smoker respondents	30	(71.4)	12	(28.6)	0.39 (0.17-0.88)	0.023
Regular smoker respondents	62	(68.1)	29	(31.9)	0.46 (0.24-0.86)	0.016

To sum up, the following variables were found to be statistically significantly associated ($p \leq 0.1$) with self-reported health conditions:

1. **Demographic and socio-cultural explanatory variables:** age, employment, level of education, crowding variable, mother chewing khat, living with other chewer, marital status, family size, period of UK residency, language preferred for reading and both country and city of birth.
2. **Psychosocial explanatory variables:** severity of dependence on khat (SDS-khat) and social participation.
3. **Behavioural variables:** many khat chewing behaviours showed significant association with self-reported health conditions as well as composite of khat behaviour and tobacco smoking.

Of the socio-cultural explanatory variables country of birth was excluded as city of birth was found to be highly significantly associated with self-reported health conditions. A summary of the explanatory variables that have been selected to enter into the hierarchical logistic regression multiple models is presented in Table 4.23.

Table 4.23: Summary of frequency distribution and results of simple logistic regression of self-reported health conditions with selected explanatory variables in a sample of UK resident adult male Yemeni khat chewers (n=204)

Demographic, socio-cultural, psychosocial and behavioural explanatory variables	Self-reported health conditions					
	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	P-value
Demographic and socio-cultural distal explanatory variables						
Age						
18-40 years	86	(83.5)	17	(16.5)	1	
41 years and older	41	(40.6)	60	(59.4)	7.40 (3.85-14.25)	0.001
Employment status						
Employed	65	(90.3)	7	(9.7)	1	
Unemployed	62	(47.0)	70	(53.0)	10.48 (4.48-24.56)	0.001
Level of education						
High education	54	(77.1)	16	(22.9)	1	
Low education	73	(54.5)	61	(45.5)	2.82 (1.47-5.42)	0.002
Crowding index^						
Overcrowded	68	(81.9)	15	(18.1)	1	
Uncrowded	58	(48.3)	62	(51.7)	4.84 (2.50-9.41)	0.001
Marital status						
Married	37	(77.1)	11	(22.9)	1	
Other marital status	90	(57.7)	66	(42.3)	2.47(1.72-5.19)	0.017
Family size						
Small	87	(74.4)	30	(25.6)	1	
Large	40	(46.0)	47	(54.0)	3.41(1.89-6.16)	0.001
Living with other chewer						
No	81	(69.2)	36	(30.8)	1	
Yes	46	(52.9)	41	(47.1)	2.01(1.13-3.57)	0.018
Mother chewing khat						
No	108	(65.5)	57	(34.5)	1	
Yes	19	(48.7)	20	(51.3)	1.94 (0.99-4.03)	0.055
City of birth						
Elsewhere	76	(69.7)	33	(30.3)	1	
Yemen khat village	51	(53.7)	44	(46.3)	1.99 (1.11-3.53)	0.019
UK Residency						
Long	46	(45.1)	56	(54.9)	1	
Short	81	(79.4)	21	(20.6)	0.21(0.12-0.40)	0.001
Language of reading						
English, English & Arabic	65	(75.6)	21	(24.4)	1	
Arabic and other	62	(52.5)	56	(47.5)	2.80 (1.52-5.15)	0.001
Psychosocial intermediate explanatory variables						
Social participation						
High	74	(74.7)	25	(25.3)	1	
Low	53	(50.5)	52	(49.5)	2.90 (1.61-5.26)	0.001
Khat dependence						
Non-dependent	75	(76.0)	24	(24.0)	1	
Dependent	51	(49.0)	53	(51.0)	3.29 (1.81-5.55)	0.001
Behavioural proximal explanatory variables						
Composite Khat behaviour						
Low	93	(71.5)	37	(28.5)	1	
High	34	(45.9)	40	(54.1)	2.96 (1.63-5.36)	0.001
Tobacco smoking						
Non smoker respondents	35	(49.3)	36	(50.7)	1	
Episodic smoker respondents	30	(71.4)	12	(28.6)	0.39 (0.17-0.88)	0.023
Regular smoker respondents	62	(68.1)	29	(31.9)	0.46 (0.24-.86)	0.016

^ One response missing

The final model of self reported health conditions as dependent variable both unadjusted and adjusted with demographic and socio-cultural, psychosocial and behavioural variables is presented in Table 4.24. The process of developing this final model alongside further modeling is described in Appendix 10F. Respondents who were older, unemployed and living in uncrowded housing were 3.10 (95%CI=1.32-7.28), 4.25 (95%CI=1.57-11.47) and 2.96 (95%CI=1.38-6.37) times more likely to self-report health conditions (Table 4.24). Other variables in the model were not found to associate with self-reported health conditions.

Entering tobacco smoking behaviour into the model, alongside the composite index of khat behaviour, contributed poorly to final model and was omitted. Omitting all the insignificant explanatory variables from the final model confirmed the significance of earlier variables identified as associated with self reported health conditions.

The results of the final hierarchical model displayed a model chi- square at 79.23 (df=11, $p<0.007$), the correct percentage classified was 76.8% of cases and a Hosmer-Lemeshow Goodness of fit at 11.59 (df=8, $p=0.193$). The model as a whole explained between 32.3% (Cox & Snell R Square) and 44.0% (Nagelkerke R Square) of the variance of self-reported health conditions.

Finally, the covariance between correlates of self-reported health conditions was tested and presented in Table 1, Appendix 10E.

In summary: a hierarchical logistic regression analysis between selected explanatory variables and self-reported health conditions was performed to assess the likelihood that respondents would self-report health conditions. As shown (Table 4.24), older

unemployed and living in uncrowded housing were the distal explanatory variable uniquely statistically significantly associated with self-reported health conditions.

Table 4.24: Final regression model of self reported health conditions and explanatory variables (n=204)

Explanatory variables	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Age						
18-40 years	86	(83.5)	17	(16.5)	1	1
41 years and older	41	(40.6)	60	(59.4)	7.40 (3.84-14.25)***	3.10 (1.32-7.28)***
Employment status						
Employed	65	(90.3)	7	(9.7)	1	1
Unemployed	62	(47.0)	70	(53.0)	10.48 (4.48-24.56) **	4.25 (1.57-11.47)***
Level of education						
High education	54	(77.1)	16	(22.9)	1	1
Low education	73	(54.5	61	(45.5)	2.82 (1.47-5.42)***	1.13 (0.48-2.68)
Crowding^						
Overcrowded	68	(81.9)	15	(18.1)	1	1
Uncrowded	58	(48.3)	62	(51.7)	4.84 (2.50-9.41)***	2.96 (1.38-6.37)***
Mother chewing khat						
No	108	(65.5)	57	(34.5)	1	1
Yes	19	(48.7)	20	(51.3)	1.94 (0.99-4.03)**	1.29 (0.51-3.25)
Living with chewer						
No	81	(69.2)	36	(30.8)	1	1
Yes	46	(52.9)	41	(47.1)	2.01 (1.13-3.57)**	1.42 (0.65-3.13)
Language of reading						
English, English & Arabic	65	(75.6)	21	(24.4)	1	1
Arabic and other	62	(52.5)	56	(47.5)	2.80 (1.52-5.15)***	0.85 (0.37-1.95)
City of birth						
Elsewhere	76	(69.7)	33	(30.3)	1	1
Yemen khat village	51	(53.7)	44	(46.3)	1.99 (1.11-3.53)**	1.24 (0.58-2.68)
Psychosocial intermediate explanatory variables						
Social participation						
High	74	(74.7)	25	(25.3)	1	1
Low	53	(50.5)	52	(49.5)	2.90 (1.61-5.26)***	2.06 (0.97-4.14)
Khat dependence						
Non-dependent	75	(76.0)	24	(24.0)	1	1
Dependent	51	(49.0)	53	(51.0)	3.29 (1.81-5.55)***	1.60 (0.66-3.85)
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	93	(71.5)	37	(28.5)	1	1
High	34	(45.9)	40	(54.1)	2.96 (1.63-5.36)***	1.20 (0.49-2.91)

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

4.4.4 Self-reported 'high' nicotine dependence

This section describes the results of the simple logistic regression between explanatory variables and self-reported 'high 'nicotine dependence. Table 4.25 shows that respondents who started cigarette smoking in the UK and elsewhere and being in 'other' marital status were more likely to self-report 'high' nicotine dependence (OR=2.39, 95%CI=0.99-5.80; OR=2.98, 95%CI=1.19-7.41).

Table 4.25: Frequency distribution and results of simple logistic regression of demographic and socio-cultural variables and self-reported 'high' nicotine dependence (n=91)

Demographic and socio-cultural variables	Se If reported 'high' nicotine dependence					
	Low N (%)		High N (%)		Unadjusted OR (95%CI)	P-value
Age						
18-40 years	28	(53.8)	24	(46.2)	1	
41 years and older	23	(59.0)	16	(41.0)	0.82 (0.35-1.88)	0.626
Residency post code						
S5+S6+ other	12	(50.0)	12	(50.0)	1	
S3+S4	39	(58.2)	28	(41.8)	0.72 (0.28-1.83)	0.488
Level of education						
High education	17	(53.1)	15	(46.9)	1	
Low education	34	(57.6)	25	(42.4)	0.83 (0.35-1.98)	0.680
Employment status						
Employed	21	(65.6)	11	(34.4)	1	
Unemployed	30	(50.8)	29	(49.2)	1.85 (0.76-4.50)	0.177
Crowding index^						
Overcrowded	23	(60.5)	15	(39.5)	1	
Uncrowded	28	(52.8)	25	(47.2)	1.37 (0.59-3.19)	0.466
Marital status						
Married	40	(64.5)	22	(35.5)	1	
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41)	0.019
Father smoking						
No	21	(63.6)	12	(36.4)	1	
Yes	30	(51.7)	28	(48.3)	1.63 (0.68-3.92)	0.273
Living with smoker						
No	37	(57.8)	27	(42.2)	1	
Yes	14	(51.9)	13	(48.1)	1.27 (0.52-3.14)	0.601
Family size						
Small	33	(55.0)	27	(45.0)	1	
Large	18	(58.1)	13	(41.9)	0.88 (0.37-2.120)	0.780
Country of birth						
Uk & other	11	(47.8)	12	(52.2)	1	
Yemen	40	(58.8)	28	(41.2)	0.64 (0.25-1.66)	0.360
City of birth						
Elsewhere	30	(51.7)	28	(48.3)	1	
Yemen khat village	21	(63.6)	12	(36.4)	0.61(0.26-1.47)	0.271
UK Residency						
Long	21	(51.2)	20	(48.8)	1	
Short	30	(60.0)	20	(40.0)	0.70 (0.30-1.61)	0.402
Language of reading						
English, English & Arabic	20	(55.6)	16	(44.4)	1	
Arabic and other	31	(56.4)	24	(43.6)	0.97 (0.42-2.26)	0.939
Place started tobacco						
Yemen	38	(63.3)	22	(36.7)	1	
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)	0.054

^ One response missing

As for the psychosocial variables, Table 4.26 shows that khat dependent respondents were more likely to self-report 'high' nicotine dependence than non-khat dependent counterparts (OR=3.00; 95%CI=1.27-7.08). The difference in self-reporting 'high' nicotine dependence between khat dependent (58.5%) and non-khat dependent (32%) respondents was statistically significant (p=0.012). Respondents reporting low social participation were also more likely to self-report 'high' nicotine dependence, compared with respondents reporting high social participation (OR=2.65; 95%CI=1.26-6.25).

Table 4.26: Frequency distribution and results of simple logistic regression of psychosocial variables and self-reported 'high' nicotine dependence in a sample of UK resident adult male Yemeni khat chewers (n=91)

Psychosocial variables	Se If reported 'high' nicotine dependence					
	Low N (%)		High N (%)		Unadjusted OR (95%CI)	P-value
Khat dependence						
Non-dependent	34	(68.0)	16	(32.0)	1	
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)	0.012
Social participation						
High	30	(68.2)	14	(31.8)	1	
Low	21	(44.7)	26	(55.3)	2.65 (1.126-6.25)	0.025

Few khat chewing behaviours showed a statistical significant association with self-reported 'high' nicotine dependence (Appendix 10D, Table 4). Both the behaviour variables (composite khat chewing and tobacco smoking), showed an important impact on levels of nicotine dependence (Table 4.27). Respondents with a high composite index of khat behaviour were more likely to self-report 'high' nicotine dependence (OR= 4.53, 95%CI=1.79-11.47). Respondents smoked more than 11 cigarettes when chewing khat and continued cigarette smoking after spitting khat were more likely to self-report 'high' nicotine dependence (OR= 4.16, 95%CI= 1.39-12.43; OR=3.29, 95%CI=1.27-8.51).

Table 4.27: Frequency distribution and results of simple logistic regression of self-reported 'high' nicotine dependence and related behaviours in a sample of UK resident adult male Yemeni khat chewers (n=91)

Behavioural variables	Self-reported 'high' nicotine dependence					
	Low N (%)		High N (%)		Unadjusted OR (95%CI)	P-value
Composite khat behaviour						
Low	41	(68.3)	19	(31.7)	1	
High	10	(32.3)	21	(67.7)	4.53 (1.79-11.47)	0.001
Smoking during chewing						
Same or less cigarettes	10	(76.9)	3	(23.1)	1	
Much or more smoking cigarettes	41	(52.6)	37	(47.4)	3.08 (0.77-11.77)	0.114
Current smoking with khat compared to 12 months						
Decrease	13	(68.4)	6	(31.6)	1	
Remained the same	22	(61.1)	14	(38.9)	1.38 (0.43-4.47)	0.593
increased	16	(45.7)	19	(54.3)	2.57 (0.80-8.32)	0.115
Smoking more in session's first hours						
No	34	(61.8)	21	(38.2)	1	
Yes	17	(47.2)	19	(52.8)	1.81 (0.77-4.28)	0.172
Number of cigarettes smoked During chewing						
UP to 10 cigarettes	19	(79.2)	5	(20.8)	1	
11 cigarettes and more	32	(47.8)	35	(52.2)	4.16 (1.39-12.43)	0.008
Continuing smoking after spitting khat						
No	23	(74.2)	8	(25.8)	1	
Yes	28	(46.7)	32	(53.3)	3.29 (1.27-8.51)	0.014

To summarise: seven variables showed statistically significant associations with self-reported 'high' nicotine dependence at p ≤0.1 in the simple logistic regression analyses (Table 4.28). These variables were entered into the next step of the hierarchical multiple logistic regression analysis. The correlation of SDS-khat with the composite index of khat behaviour was rho = 0.47. It was decided first to test the multivariate model with both variables together and then with each one separately.

Table 4.28: Summary of frequency distribution and results of simple logistic regression of self-reported 'high' nicotine dependence with selected explanatory variables in a sample of UK resident adult male Yemeni khat chewers (n=91)

Demographic, socio-cultural, psychosocial and behavioural explanatory variables	Self-reported 'high' nicotine dependence					
	Low N (%)		High N (%)		Unadjusted OR (95%CI)	P-value
Demographic and socio-cultural distal explanatory variables						
Place started tobacco						
Yemen	38	(63.3)	22	(36.7)	1	
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)	0.054
Marital status						
Married	40	(64.5)	22	(35.5)	1	
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41)	0.019
Psychosocial intermediate explanatory variables						
Khat dependence						
Non-dependent	34	(68.0)	16	(32.0)	1	
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)	0.012
Social participation						
High	30	(68.2)	14	(31.8)	1	
Low	21	(44.7)	26	(55.3)	2.65 (1.12-6.25)	0.025
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	41	(68.3)	19	(31.7)	1	
High	10	(32.3)	21	(67.7)	4.53 (1.79-11.47)	0.001
Cigarettes smoked during chewing						
UP to 10 cigarettes	19	(79.2)	5	(20.8)	1	
11 cigarettes and more	32	(47.8)	35	(52.2)	4.16 (1.39-12.43)	0.008
Continuing smoking after spitting khat						
No	23	(74.2)	8	(25.8)	1	
Yes	28	(46.7)	32	(53.3)	3.29 (1.27-8.51)	0.014

The final model of self reported 'high' nicotine dependence as dependent variable both unadjusted and adjusted with socio-demographic, psychosocial and behavioural variables, is presented in Table 4.29. The process of developing this model alongside further modelling is described in Appendix 10F. Respondents who started tobacco smoking in the UK and elsewhere as opposed to Yemen, in 'Other' marital status (widowed, single or divorced) and reporting low social participation were more likely to self-report 'high' nicotine dependence (OR=3.18,95%CI=1.03-9.77;OR=3.29, 95%CI=1.11-9.74, OR=3.69, 95%CI= 1.18-11.51 respectively).

Omitting all the insignificant explanatory variables from the final model confirmed the significance of earlier variables identified as associated with self-reported 'high' nicotine dependence.

The results of the final hierarchical model displayed a model chi- square at 30.08 (df=6, $p<0.001$), the correct percentage classified was 74.7 % of cases and a Hosmer-Lemeshow Goodness of fit at 11.26 (df=8, $p=0.187$). The model as a whole explained between 28.1% (Cox & Snell R Square) and 37.7% (Nagelkerke R Square) of the variance of self-reported 'high' nicotine dependence among respondents.

Finally, covariance between correlates of self-reported 'high' nicotine dependence was tested and presented in Table 2, Appendix 10E.

In summary, in the final model of the hierarchical logistic regression analysis (Table 4.29) when both the composite of khat behaviour and SDS were entered into the model consecutively three selected explanatory distal variables made unique statistically significant contributions. These were place of starting smoking, marital status and social participation. After omitting SDS-khat, the model showed (Appendix 10F, Table 7) that respondents who started smoking in the UK and elsewhere than the Yemen, being in 'other' marital status, with low social participation, with high composite khat behaviour and smoking more than 10 cigarettes during a khat chewing session were more likely to self-report 'high' nicotine dependence. When the composite index of khat chewing behaviour was omitted from the model, respondents who started smoking in the UK and elsewhere than the Yemen, being in 'other' marital status, with low social participation and being dependent on khat were more likely to self-report 'high' nicotine dependence (Appendix 10F, Table 8) .

Table 4.29: Final regression model of self-reported 'high' nicotine dependence and explanatory variables (n=91)

Explanatory Variables	Low N (%)		High N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Place started tobacco						
Yemen	38	(63.3	22	36.7)	1	1
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)*	3.18 (1.03-9.77)**
Marital status						
Married	40	(64.5)	22	(35.5)	1	1
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41) **	3.29 (1.11-9.74) **
Psychosocial intermediate explanatory variables						
Social participation						
High	30	(68.2)	14	(31.8)	1	1
Low	21	(44.7)	26	(55.3)	2.65 (1.12-6.25)**	3.69 (1.18-11.51)**
Khat dependence						
Non-dependent	34	(68.0)	16	(32.0)	1	1
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)**	1.67 (0.52-5.35)
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	41	(68.3)	19	(31.7)	1	1
High	10	(32.3)	21	(67.7)	4.53 (1.79-11.47)***	2.72 (0.81-9.13)
Cigarettes smoked during chewing						
Up to 10 cigarettes	19	(79.2)	5	(20.8)	1	1
11 cigarettes and more	32	(47.8)	35	(52.2)	4.16 (1.39-12.43)***	3.12 (0.88-11.10)

***P≤ 0.1, **P≤0.05, ***P≤0.001**

4.4.5 Summary of modelling health outcomes

Hierarchical multiple logistic regression models were developed to predict the four health outcomes (self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence). These models demonstrated the following:

1. With respect to self-report 'compromised' health, four distal explanatory variables made uniquely statistically significantly associations. These were being older, unemployed, living in uncrowded housing and reporting low social participation.

2. With respect to self-report oral problems, one distal explanatory variable made a unique statistically significant association. This explanatory predictor was low level of completed education.

3. With respect to self-report health conditions, three distal explanatory variables made unique statistically significant contribution. These explanatory predictors were being older, unemployed and living in uncrowded housing

4. With respect to self-report 'high' nicotine dependence, three explanatory distal variables made unique statistically significant contribution. These explanatory predictors were starting smoking in the UK or elsewhere as opposed to Yemen, being in 'other' marital status (divorced, single or widow) and reporting low social participation.

Chapter 5. Discussion

5.1 Introduction

It was argued in the literature that khat chewing behaviour was associated with a range of unfavourable health outcomes. The social context of khat chewing was reported as awaiting exploration and in this study has been assessed within the criteria of public health. Therefore, this study aimed to identify the characteristics of a sample of Yemeni khat chewers in Sheffield and to explore how these characteristics are associated with health outcomes, namely, self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence.

This chapter, first, discusses the correlates of health outcomes investigated, then, reports unsupported hypotheses, after, describes the strengths and limitations of the study to clarify the study findings and finally draws conclusions alongside incidental findings from the study, research implications and policy recommendations.

5.2 Correlates of study health outcomes

5.2.1 Self-rated 'compromised' health

The correlates of self-rated 'compromised' health were: being older, unemployed, living in uncrowded housing and having low social participation.

Age was found to be one of the correlates that influenced the self-rating 'compromised' health. In national samples of Japanese, Irish and Greeks self-rated health was found associated with being older (Kawada et al., 2009 Kelleher et al., 2003; Alexopoulos et al.,2009). Self-reported poor health was reported to increase

with age (Molarius et al., 2007; Becue-Bertaut et al., 2008; McFadden et al.,2008). With the acknowledgment that the older age in this study was over 40 years, Molarius et al (2007) reported that the proportion of neither good nor poor (fair) ratings of health increased consistently with age and was highest in the oldest age group 65–79 years. Therefore, it was not surprising as the current study sample includes 25% over 65 years old and self-rated 'compromised' health was observed as well in this sample associated with increase in age (see Appendix 10A, Table A.16). According to Hambleton et al (2005) elderly current health may be decisively informed by past events. Self-rated poor health amongst elderly Barbadians was determined by their past socioeconomic status. This could be the case as in this sample; the elderly retired were involved in non-skilled jobs before retirement.

The findings of this study support the hypothesis that unemployed respondents were more likely to self-rate 'compromised' health. Studies investigating the role of employment in relationship to khat chewers' health are sparse in the literature. However, this finding lends further support to the existing body of evidence that highlight socioeconomic inequality in health. Low self-rated health has been reported amongst unemployed men and amongst unemployed women (Kaleta et al., 2008). In Brazil and Ireland, low self-rated health was reported amongst male unemployed (Szwarcwald et al., 2005; Kelleher et al., 2003). In Sweden, during the period of 1992-1997 when the unemployment was high prevalence of self-rated poor health was higher than it was in the 1980s (Ahs and Westerling, 2006). The English Census for 2001 reported that the rate of reporting of having poor health was higher amongst unemployed (Popham and Bambra, 2010).

One can argue that different strata of unemployment were combined in this study, which had a potential to create bias, although Molarius et al (2007) showed that the early retired and retired due to age or living on benefit were all predictors of self-rated poor health.

It was hypothesized also that respondents living in crowded housing were more likely to self-rate 'compromised' health. The literature reports poor housing conditions as a social determinant that can affect health through its distal (neighbourhood) and proximal (housing dampness, overcrowding) factors (Shaw, 2004). Living in an overcrowded household increased the risk of having traumatic injuries, poor mental health and heart disease later in life (Marcenes and Murray, 2001; Bashir, 2002). However, the findings of this study reported here were contrary to the literature. The role of living in uncrowded housing has been highlighted as an aspect of inequality in health (self-rated 'compromised' health) amongst respondents. According to Galobardes et al (2007) variation in the association between SEP and health provides a better understanding of different aetiological mechanisms that may be relating specific diseases with specific exposures. Similar to our study findings, Strand et al (2007) reported a higher incidence of breast cancer among wealthier and better educated women than their counterparts' low socioeconomic status. Women of higher SEP have fewer children and have them later in life, partly explaining the increased risk of developing breast cancer in this group. Social ties at home was postulated as one of the social support (Barrera., 1986). Living alone was found as a predictor of self-rated health as poor amongst 2641 patients, aged 65 years and over (Kharicha et al., 2007). Amongst employed mothers being alone was one of the predictor of self rated poor health (Floderus et al., 2008).

Putting the findings of the study within the context of the respondents, 33 respondents lived by themselves and 36 privately rented and sharing with others. Whilst overcrowding has it negative impacts on health (psychologically and physically) as mentioned early, in this case for a chewer to live by one's self or in a place with no social ties and lacking a shared environment that could be protecting health, some negative impact is inevitable. In the UK informal reports have recently described the poor living conditions and isolation among khat chewers (ACMD, 2005).

Finally, the hypothesis of having low social participation in self-rated 'compromised' health was supported in this current study. The literature has reported the important role of high social participation amongst the higher SEP in enhancing health related behaviour including leisure time physical activity and cessation of smoking (Lindstrom et al., 2001; Lindstrom et al., 2000). Low social participation and trust were found to be associated with self-rated poor health (Lindstrom, 2004). Molarius et al (2007), in a study that covered 58 municipalities in Sweden, reported poor self-rated health amongst person having low social support. Veenstra (2000) reported the importance of attendance at religious services and participation in clubs for self-rated health amongst the elderly. Amongst Swedish with equal socioeconomic circumstances self-rated health was explained by differences in social participation and trust in others (Hyyppa and Maki, 2001). In diverse countries across Europe social participation through less frequent attendance at religious services, which is considered as an aspect of social capital, was associated with self-reported poor health (Nicholson et al., 2009). Finally, different aspects of social relations such as networks and participation in associations were reported to be associated with self-rated health (Kawachi, 1999; Melchior et al., 2003; Molarius et al., 2007).

5.2.2 Self-reported oral problems

A range of oral problems were self-reported and these included, missing teeth, gum problem, caries, TMJ problems and others (dental appliance problems and dry mouth).

None of the postulated hypotheses were found to be associated with self-reported oral problems, apart from level of completed education. This is not surprising as there is currently increasing evidence for the role of level of completed education or gradient of education in relationship to oral health. According to Galobardes et al (2007), each indicator of SEP will emphasise a particular aspect of social stratification which may be more or less relevant to different health outcomes.

Knowledge and skills attained through education may make individuals more receptive to health education messages or more able to communicate with and access appropriate health services (Galobardes et al., 2006b). Daoud et al (2009) reported that level of education in adulthood translates into job opportunities, ultimately expressed as income level, standard of living and quality of life. Higher income enables individuals to acquire essential goods, live in advantaged neighbourhoods and pay for superior health services. However, capturing the socio-economic status of migrant people is difficult. For example, Galobardes et al (2006a) cited a range of limitations that are inherent in using different socioeconomic indicators such as education level as correlates of health outcomes.

In a different educational regime indicators of education may have very different implications than within the host country. As such, measuring the number of years of education or levels of attainment may not provide information about the quality of the

educational experience, which is likely to be important if conceptualising the role of education in health outcomes specifically related to knowledge, cognitive skills, and analytical abilities. This could be the case for this sample as a high level of completed education was found to co-vary with the proficiency of English language. The proxy variable (language) was presumed to be indicative of the group's characteristics without providing any explanation how this might be extrapolated from the variable (Hunt et al., 2004).

Notwithstanding, Paulander et al (2003) showed that amongst 1093 randomly selected Swedish subjects, respondents with low level of education had fewer intact tooth surfaces and significantly poorer occlusal functioning. Nikias et al (1977) reported that low level of education was associated with loss of tooth and periodontal disease. Locker and Leake (1993) reported that a low level of education was the only indicator of SEP that predicted periodontal disease amongst 602 elderly Canadian. Recently, Tsakos et al (2009) reported that low educational level has an independent negative impact on oral health related quality of life (OHRQoL) in older people. Low level of education and particularly gradient in education level was found an important predictor of self perceived oral health (Sabbah et al., 2007). Very recently, low level of education, was found to be the predictor of untreated dental decay among 15-34-year-old Australians (Jamieson et al., 2009). Finally, similarly to this study findings, the direct implications of drug use such as self reported dry mouth and TMJ problems by drug users (ecstasy) was reported by Baylen and Rosenberg (2006), though, the social context was not reported.

The impact of low level of completed education in self-reporting oral problems in this sample might have its effect through acculturation. As we have stated (Appendix 10F)

that the preferred reading language is reported as a proxy for level of education attained (Woloshin et al., 1997). Therefore, low level of education could have exerted its effects through language proficiency. The latter might have acted as a constraint in accessing health care services and being receptive to health information related to oral health, which in turn had its impact on chewers' self-reported oral problems.

Khat chewing behaviour has been repeatedly reported in the literature as a determinant of oral health impact. In this study only a few khat chewing behaviours were found to be correlated with self-reported oral problems (Appendix 10D, Table 2). The composite khat behaviour variable did not. After adjusting the model for the composite khat behaviour variable by itself and together with other oral health related behaviour (dental attendance) and health risk behaviour (smoking tobacco), the role of these behaviours was not sustained. Sanders et al (2006), highlighted that other behaviours such as smoking and alcohol use were not investigated in her study, and demonstrated that the behaviours of dental attendance and dental self care accounted for little, if any, of the socioeconomic gradient in oral health. Also, Reid et al (2004) underpinned these findings. Therefore, our current study may lend further support to the lack of importance of behavioural variables in explaining inequality in oral health.

5.2.3 Self-reported health conditions

In this current study a range of health conditions were reported and these included: cardiovascular problems, diabetes, asthma, arthritis and depression. The correlates of these health conditions were identified as being older, unemployed and living in uncrowded housing.

With respect to the association of age with self-reported health conditions, advancing age was a predictor of self-reported diabetes among Canadians aged 18 years and older (Millar and Young, 2003). Lakatta (2002) reported that specific changes in resting cardiovascular structure and function occur with advancing age in healthy humans. The analysis of the 1987 National Medical Expenditure Survey revealed that 88% of 65 year olds had at least one chronic medical conditions (Hoffman et al., 1996). In addition, age was also reported as a predictor of chronic conditions that included Type 2 diabetes mellitus, angina, cancer and osteoparthritis amongst Ausralian men (Martin et al., 2008).

The findings of this study supported the relationship of self-reported health conditions with adverse SEP (unemployment). Yang et al (2009) reported that Chinese community-dwelling people with type 2 diabetes being unemployed with low perceived social support and longer diabetic duration were more likely to report depression. Ferrie et al (2002) reported the effects of chronic job insecurity and change in job security on self-reported health, psychiatric morbidity and physiological measures in British civil servants. In addition, self-reported bad psychological health was found associated with unemployment (Lindstrom, 2004). Graetz (1993), reported that employed people report significantly lower levels of health disorder than students and the unemployed. Amongst the Serbian population self-reported arthritis was more likely amongst both sexes of poorest groups as measured by a wealth index (Vukovic et al., 2008). According to Hoffmann (2007), in a German National Telephone Survey, asthma was linked with being unemployed amongst 18 years and older. Finally, unemployment was linked with cancer and mental health impacts amongst Australian men and Canadian immigrants (Martin et al., 2008; Dean and Wilson, 2009).

The contrary of the hypothesis proposed in this current study was established; living in uncrowded housing was associated with self-reported health conditions. As previously mentioned (Chapter 5 Section 5.2.1), different aspects of housing may affect physical, social and the mental well being of occupants. Social isolation such as living alone has been proposed to affect all age groups in particular older adults (House et al., 1988). Living alone has been reported as a predictor of dying after myocardial infarction, self-reported health conditions, self-reported long standing psychiatric illnesses and low resistance to upper respiratory illness and depression (Case RB, 1992; Kharicha et al., 2007; Bayard-Burfield et al., 2001; Cohen et al., 1997; Cacioppo et al., 2006).

5.2.4 Self-reported 'high' nicotine dependence as measured by FTND

The key correlates for self-reporting 'high' nicotine dependence were being divorced, single and widowed, having low social participation and starting smoking in UK and elsewhere as opposed to Yemen. The role of these correlates in relationship with self-reported 'high' nicotine dependence is sparse in the literature in particular amongst diasporas' khat chewers. In the absence of the data relevant literature can be refered to.

The protective and damaging effects of marital status with health related behaviours and health outcomes were suggested. Being married or cohabiting was found to be protective from alcohol–related death (Rahu et al., 2009; Chenet et al., 1998; Koskinen et al., 2007). One of the predictors of chewing tobacco and concurrent tobacco use (smoking and chewing tobacco) among Bangladeshi men was a wife chewing (Croucher et al., 2007). Amongst pregnant women, to have a non-smoking partner was the predictor of tobacco cessation (Yunis et al., 2007; Woodby et al.,

1999). In a random telephone survey of 26,716 households the prevalence of current tobacco smoking amongst Hong Kong Chinese women was reported as 4.5% and being divorced was identified as a risk for the uptake of smoking (Lau et al., 2003). Fidler et al (2008) reported greater level of cotinione (predictor of nicotine dependence) amongst singles. Cook et al (2009) reported that the 12 month prevalence of mental health and substance use disorders amongst single mothers was higher than in the general US population. Lifetime mood disorder remained lower amongst cohabiting and higher amongst ever married mothers. Being unmarried was one of the predictors of continuing smoking amongst older adults living in Bambuí, Southeastern Brazil (Peixoto et al., 2005). Last but not least, being divorced and separated was linked to asthma (Martin et al., 2008).

The hypothesis of having low social participation in relationship to self-reported 'high' nicotine dependence was supported. Lindstrom et al (2000) reported the role of social participation in tobacco cessation. Lack of social support such as living alone was found as a nutritional risk amongst older black men (Locher et al., 2005). Lack of social support was found as a predictor of relapse in abstinence amongst tobacco smokers in standard care compared with smokers receiving multicomponent treatment intervention (Buchanan et al., 2004). Very recently, Al- Dubai and Rampal (2009) reported feelings of isolation as one of the determinants of self reported burnout amongst Yemeni medical doctors.

The association of 'high' nicotine dependence with starting smoking in the UK could be because khat chewing and the correlated tobacco smoking behaviour in Yemen is more regulated. Therefore, the negative effects of acculturation through adopting the high consumption of tobacco and the relationship with high nicotine dependence

could be postulated. According to McQueen et al ((2003) adult Mexican men who migrated to the United States appreared to adopt the more frequent drinking patterns preferred by the American but maintain their high quantities per occasion, which is more common in Mexico. Abraido-Lanza et al (2005) reported that in both gender amongst Latino(a)s a high level of acculturation as measured by length of stay in the USA, found associated with a two fold higher likelihood of consuming moderate to high alcohol amounts. Further exploration for this study data showed that there was a statistical significant association (P≤0.050) between place of starting tobacco smoking and marital status. Forty eight percent of widowed and divorced chewers started smoking in the UK compared with 27% married (Appendix 10E, Table 2). Therefore, the role of these covariates in self-reported 'high' nicotine dependence is plausible.

5.3 Unsupported hypotheses

The current literature suggests the independent contribution of neighbourhood disadvantage (contextual) over and above individual-level socioeconomic position (compositional) in health outcomes such as self reported poor oral health (Turrell et al., 2007). However, this hypothesis was not supported in this study in relationship with self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence. This was not surprising since the contextual circumstance (73% of respondents living in Sheffield 3 and 4) was equal for most respondents. Most respondents during the study were living in areas that included Burngreave and Fir Vale. These areas are classified as poor (Sheffield City Council, 2004). According to Clare (2005), when social networks come together at specific locations this can be characterised as a form of negative social network. A mutually reinforcing subculture in the areas may bind the network to it and will draw people back if they try to leave it (Clare, 2005).

Likewise, housing tenure for this study was not found to be associated with health outcomes. This is obvious due to a lack of variation in the data that could have discriminated between the effects of different home ownership on health. In this sample only 10% of the study participants owned their homes.

With respect to behavioural factors (composite khat behaviour, smoking and dental attendance), none of these behaviours were linked to the health outcomes investigated in this current study. There is currently growing evidence demonstrating the unimportance of behaviours and the emergence of 'up stream factors' that include SEP and material deprivation. However, we should also consider other alternative explanations in relation to this study, including prevalence type, incomplete control of other factors and the characteristics of study population which need future investigation. For example, in this study we identified that only 38% attended a dentist for regular checks. Oral health and oral heath related behaviours such as dental attendance are complex outcomes. Specific attitudes and beliefs alongside culture, percieved dental needs and dental care and other influences such as social, economic and environmental conditions are known to predict oral diseases and behaviours (Riley et al., 2006; Kiyak, 1993; Pau et al., 2008; Watt, 2002).

Apart from the relationship of place of starting smoking with nicotine dependence, none of the acculturation variables such as years of residency and place of birth were found to be statistically significantly associated with the health outcomes investigated. Most of our sample participants were born in Yemen; therefore, the discriminatory effect of this variable on health outcomes might not be transmittable. Years of living in the UK needs further investigation through qualitative research.

Acculturation factors such as language use can be used as a proxy for the socio-economics of the individual (Woloshin et al., 1997). We have demonstrated in Appendix 10F the overlap of level of completed education with language of reading in relationship to self-reported oral problems when entered in the multiple logistic regressions.

The effect of severity of dependence on khat (SDS-khat) in the multiple logistic regressions on health outcomes, namely, self-rated 'compromised' health, self-reported oral problems and self-reported health conditions was minimised when entered alongside social participation variables and other distal factors. This could be attributed to the unimportance of SDS-khat to these health outcomes in this study sample. The importance of distal factors alongside social participation and other protective coping resources postulated by Antonovsky (1987) and not incorporated in this study were likely to differentiate the sample participants in the aforementioned health outcomes. Our findings were underpinned by further analysis that investigated the SDS-khat effect on these health outcomes separately and alongside the composite khat behaviour.

On the other hand, the role of SDS-khat in relationship with self-report 'high' nicotine dependence could be hypothesized. The SDS-khat when entered into the model alongside the social participation variable remained significant. However, SDS-khat lost its relationship with self-reported 'high' nicotine dependence in the presence of the composite khat behaviour and number of cigarette smoked during chewing. The covariance of SDS-khat and composite khat behaviour should be considered as was demonstrated in Appendix 10F.

5.4 Strengths and limitations of the study

The major strengths of this study were as follows:

1.The comprehensive assessment of a wide range of potential exposures to the outcomes measures (Hennekens and Buring, 1987).

2. The cost and time effectiveness of the nature of this study.

3. Recall bias was excluded as we collected current information on socio-economic position and other variables.

4. A diverse community based large sample was collected. In this study a more robust approach was adapted compared to other studies. We recruited chewers from different outlets of khat sale and during different times to minimise selection bias. Previous studies have relied on privilege access interviwers (PAI) (Griffiths, 1998; Patel et al., 2005). PAI is well recognized as having the limitation of sample selection.

5. A range of approaches was adapted to handle the data collected that included analytical statistical analysis e.g factor analysis of SDS-khat. Technologically objective validations of khat chewing and tobacco smoking status were undertaken. In this study we validated self-reported khat chewing with cathinone in saliva. Detection of khat chewing amongst chewers was collected in previous studies through detection of cathinone and its metabolites in urine and blood of chewers (Toennes and Kauert, 2002). Self-reported regular and episodic tobacco smoking was validated with expired CO air.

On the other hand the limitations of this study might be summarised as follow:

1. In cross sectional studies a cause effect criterion (Hill, 1965) is implausible as the outcomes could precede the exposure (predictor variables) or vice versa (Hennekens and Buring, 1987). In other words, a temporal relationship between risk factors and unfavourable health outcome is not established.

2. The validation of khat dependence with different levels of the biomarker cathinone was not supported due to the nature of this substance and its rapid decomposition to cathine and norephedrine (Nencini and Ahmed, 1989a). Saliva collected amongst chewers who were chewing intensively only for one day a week exhibited high concentration of cathinone, compared with daily chewers' saliva collected at other time than chewing. Therefore, in this study, alternatively, the dependent use of khat can be detected in the blood, urine and hair of khat chewer. Cathinone in the former two matrices reported the current use and the latter reported the repeated and past use (Toennes and Kauert, 2002; Sporkert et al., 2003; Kim et al., 2007). The nature of our current study in the communities restricted us from obtaining such materials in terms of time and the potential for cross infection (Toennes et al., 2005)**.**
3. Health outcomes reports such as self-reported oral problems, self-rated 'compromised' health and self-reported health conditions could have been validated by incorporating a dental clinical examination or using general practitioners' medical reports. This was beyond the parameters of this study as they were reported in other studies as time consuming and costly (Bernabe et al., 2009). In addition, there are several important reasons for investigating lay peoples' perception of their health and in particular oral health. For example assessment of treatment needs require information not only about normative (professional) but also about perceived (lay defined) needs (Pattussi et al., 2007). Finally, the literature supports patient-centred measures (Coulter et al., 1994).
4. As for self rated health, Bowling (1991) reported that the 'use of single item measures is least preferable because it is doubtful that one question can effectively tap a given phenomenon'. According to Cott et al (1999) in the Ontario Health Survey 79% of these with chronic disorders reported their heath was good

to excellent which raised a question about the distinction between people's self rated perceptions of their health status and a diagnosis of a medical condition or disability. In line with this Manderbacka (1998) and Jylha (1994) reported health as 'context bound'. Locker et al (2008) also reported that a different frame of reference underlies the self rating of oral health and as a consequence the response option chosen by respondents merely indicates the label people use to summarize those perceptions. In addition, a variation in the meaning of self rated health amongst groups from different SES was reported with age the main source of variation. In this study, time and constraints on respondent participation should be acknowledged. As for self reported oral problems, this study has not assessed a specific oral problem. Tomar (2007) reported that assessing self reported periodontal problem using individual items created invalid markers for clinically determined periodontitis. A multivariable statistical modeling approach which includes variables on signs, symptoms and established risk factors such as smoking, diabetes, and socio-demographic characteristics could improve the approach of self report oral health problem(s).

5. The dichotomizing of the variables through imposing a cut off point on values such as age is reported as possibly resulting in loss of information in this study (Altman, 1999). Regrouping the health outcome of self rated health into 'compromised' and 'uncompromised' may also have underestimated the strength of some associations (Pattussi et al., 2007) and contributed to misclassification.
6. This study recruited only khat chewers. The inferences that were made from the results of this study could have been strengthened if non khat chewers were included.
7. Type II error might have occurred that rendered association between health outcomes and potential independent variables insignificant. This error could be

attributed to small sample size. In addition, displaying the poster of the study in khat sales' places could have played a role in khat chewers' self selection into the study. This group may have presented some homogenous characteristics which limited variation in responses.

8. The internal validity of this study was maintained by the use of a structured questionnaire and ascertaining khat chewing through the use of biomarker cathinone and tobacco smoking through carbon monoxide. However, the constraints the study faced in respect of not adopting random sample of the whole population of the Yemeni community (described in Chapter 3 Section 3.4.2) made extrapolation of these results beyond this study sample inappropriate.
9. This research has been carried out through the use of a face to face interview. Face to face interviews are recognized as producing bias. However, with the acknowledgment that the sample incorporated a significant number of khat chewers who had finished their education in Yemen this could balance the capability of chewers who might suffer from reading and understanding problems to respond (Atchison et al., 1998).
10. It should be noted that any researcher might have limited control of some aspects of a study. Displaying the study poster in the places of khat sellers might not be sufficient to attract potential khat chewers. It was informally reported that the poster was removed at one khat seller's place when the researcher was not there.
11. Finally, the number of recruited khat sellers through social network (khat chewers and heads of Yemeni community) could have been enhanced through mapping the targeted area (Longman et al., *in press*) of this study. This method could have allowed a complete number of khat sellers to be recruited. This in return may have permitted more khat chewers with diverse characteristics to be recruited.

5.5 Conclusions

The aims of this study were, first, to establish the characteristics of a sample of Yemeni Khat chewers in Sheffield, and second, to explore how these characteristics are associated with health outcomes, namely, self-rated 'compromised' health, self-reported oral problems, self-reported health conditions and self-reported 'high' nicotine dependence.

As for the first aim, in general, this purposive sample of Yemeni khat chewers had been identified as deprived and this can be attributed to:

1- High percentage of unemployment.
2- Low level of completed education.
3- High occupancy in social housing
4- Social isolation and less acculturation.

The testing of the hypotheses, previously proposed (Chapter 2, Section 2.11), related to the second aim are as follows:

1. Low level of completed education was found to be a risk factor for self-reported oral problems.
2. Being unemployed was found to be a risk factor for self-rated 'compromised' health and self-reported health conditions.
3. Independently of the employment status of respondents, living in uncrowded housing was found to be a risk factor for self-rated 'compromised' health and self-reported health conditions.
4. Low social participation was found to be a risk factor for self-rated 'compromised' health and self-reported 'high' nicotine dependence.

5. Being in ‘other’ marital status (divorced, widowed, single) and starting tobacco smoking elsewhere than the Yemen were found risk factors for self-reported ‘high’ nicotine dependence.
6. Other hypotheses that were not supported were discussed in Chapter 5, Section 5.3.

5.6 New incidental findings from this study

1- The construct validity of SDS-khat in measuring khat dependence in this study sample was demonstrated using composite khat behaviour and structural analysis of the SDS-khat. Studies of the validity of SDS in other drugs such as alcohol and cocaine used factor analysis and individual drug behaviour items such as frequency of use (Ferri et al., 2000; Lawrinson et al., 2007; Gossop et al., 1995). This study has introduced a composite khat behaviour index, which integrated many behaviours related to khat chewing. As shown in this study (Chapter 4, Section 4.3.5) the composite khat behaviour correlated with SDS-khat.

2- Khat environment as an initiator to tobacco smoking amongst regular and episodic tobacco smokers was demonstrated. Kassim and Croucher (2006), Griffiths (1998), Nencini et al (1984) have proposed that khat use initiated tobacco smoking amongst chewers. The contribution of this study is in investigating retrospectively initiators of tobacco smoking amongst regular smokers alongside the current initiation amongst episodic smokers.

3- Significant differences were observed in carbon monoxide measures taken during khat chewing compared with other times. Kassim and Croucher (2006), Griffiths (1998), Nencini et al (1984) have reported that tobacco use amongst regular smokers increased during khat chewing. In this study we have further

asked regular and episodic smokers to report if they noted an increase in their smoking during chewing and we compared levels of CO amongst two groups of regular smoker chewers during khat chewing and other times. Levels of CO amongst two groups of episodic smoker chewers during khat chewing and other times were also compared.

4- The concurrent use of tobacco smoking when chewing was investigated in this study. Perceived importance of tobacco for improving impact of khat effects amongst both regular and episodic tobacco smoker respondents was established in this study.

5.7 Research implications

The health impacts amongst this sample of UK-Yemeni male khat chewers were attributed to important 'upstream factors'. These factors (material deprivation and social isolation) are currently recognised as common risk factors, as they are shared by many health outcomes, health risk behaviours and health treatment outcomes (Sheiham and Nicolau, 2005; Sabbah et al., 2009; Mavrinac et al., 2009; Falconnier, 2009). Therefore, this study will inform future research to explore further the pathways, including psychosocial and biological factors, through which these upstream factors may influence oral and general health clinical outcomes amongst chewers in different settings and amongst different communities chewing khat.

Second, tobacco use is a well known common risk factor for both oral and systemic disease (Sheiham and Watt, 2000). The role of khat chewing either as an initiator of tobacco smoking amongst episodic smokers and regular smokers or as encouraging an increase in tobacco smoking during chewing, has been described in this study. Future research should consider qualitative methods to support or challenge whether

khat chewing acts as a gateway to regular tobacco smoking as well as the role of khat chewing amongst regular smokers in creating high nicotine dependence. This study has also proposed an approach to tobacco smoking during khat chewing as 'episodic'. This concept needs further exploration in future research.

Third, in epidemiology there are many study designs that can be employed to explore khat chewing's impacts on health outcomes and the quality of life of chewers. A prospective cohort study design would assess forward directionality between the health impacts that may be caused by concurrent khat chewing and tobacco smoking, chewing khat alone and chewing khat with episodic tobacco smoking (al'Absi, 2009). However, this would be resource intensive and might be deemed unethical. A case control study design might be more acceptable to develop our current knowledge about the relationship of khat chewing with health outcomes.

Further, the life course approach that has been described in Chapter 2, Section 2.6 would be beneficial in studying the role of khat chewing in health outcomes. The life course approach would propose that a young child may be socialised into health compromising behaviours such as khat chewing leading to adult health inequality (Singh-Manoux and Marmot, 2005). The suggestion of the literature of low birth weight outcomes amongst chewer mothers would also benefit from the early life course approach. This latter will link the pathways between early (prenatal life) exposure to mothers' khat chewing and adverse social factors to later life health outcomes (Kuh et al., 2003).

Fourth, the validation of SDS-khat, using other metabolites of cathinone such as cathine and norephedrine (Nencini and Ahmed, 1989a) in saliva, awaits development.

In tobacco research salivary cotinine is an excellent non invasive tool for identifying smokers and also a good means of quantifying nicotine intake (Benowitz and Jacob, 1994). A similar methodology might offer validation opportunities for khat chewing. Additionally, in this study most respondents chewed Herari khat. The impacts of different types of khat chewing (Mirra, Herari and Yemeni) in creating dependence in different communities warrant assessment in future research. Importantly, the composite index of khat chewing behaviour developed in this study needs further testing in other samples of khat chewers, not only Yemenis.

Finally, pooling studies of the impact of khat chewing on quality of life of khat chewers from different backgrounds would lead to future research to elucidate protective and risk factors. These studies should consider as well data from female khat chewers, including UK Yemeni females.

5.8 Policy recommendations

Drawing policy recommendations based on a cross-sectional study is difficult (Newton and Bower, 2005). The emergence of 'upstream factors' such as different aspects of socio- economic status of chewers as correlates with health outcomes investigated in this study has lent further support to the current literature on socio-economic inequalities in health. Therefore, at a population level, public health policy should take into account these factors when addressing the khat chewing behaviour of UK minorities. The proposal of increasing sales tax on khat and to potentially reduce its availability to two days per week in the UK (Klein et al., 2009) should acknowledge that such policies collapsed in Aden-Yemen and Somalia when the underlying social determinants were left unresolved (Brooke, 1960; Luqman and Danowski, 1976; Elmi et al., 1987; Lenard and Al-Sabry, 1995; Baasher, 1981). A Fatwa in Saudi Arabia to

prohibit khat chewing on religious ground was launched more than 25 years ago (Baasher, 1981). Any evaluation of this Fatwa with respect of current khat chewing in Suadia Arabia has yet to be reported.

The holistic approach proposed by WHO (2007) should be considered nationally and internationally. This approach takes into account the newly emerging socially unconstrained patterns of khat consumption which differ from the traditional and more socially constrained patterns. These unconstrained patterns may lead to negative health impacts and socio-economic consequences. The WHO (2007) proposes preventive and harm reducing actions that reduce the possibility of a transition from khat use to other more dangerous substance.

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Zelger JL, Carlini EA (1980). Anorexigenic effects of two amines obtained from Catha edulis Forsk. (Khat) in rats. *Pharmacol Biochem Behav* 12(5)*:* 701-5.

Zini A, Vered Y, Sgan-Cohen HD (2009). Are immigrant populations aware about their oral health status? A study among immigrants from Ethiopia. *BMC Public Health* 9 (205).

Appendices

Appendix 1A: Types of khat

Yemeni Khat

Source:
http://www.yementimes.com/00/iss32/images/qat1.jpg
Image:http://www.yementimes.com/00/iss32/health.htm (Accessed on: 25/8/2006)

Source:
http://www.esmas.com/noticierostelevisa/noticieros/313586.html
Image:http://i.esmas.com/image/0/000/002/951/khat_N.jpg (Accessed on: 25/8/2006)

Mirra Khat – Kenya
Source: http://www.a1b2c3.com/drugs/khat1.htm
Image: http://www.a1b2c3.com/drugs/khat1a.jpg (Accessed on: 25/8/2006)

Herari khat – Ethiopia
Source: UK Advisory Committee on the Misuse of Drugs (2005) *Khat (Qat):* Assessment of risk to the individual and communities in the UK. Home office

Appendix 1B: Khat session in Yemen

Source: http://www.worldandi.com/public/2002/january/teller.html
Image: http://www.worldandi.com/public/2002/january/graphics/teller3.jpg
(Accessed on: 23/8/2005)

Appendix 1C: khat chewing session accompaniments

Source: http://www.mypicx.com/uploadimg/848670013_05282010_1.jpg

Appendix 1D: Mode of khat chewing

Source: http://slog.thestranger.com/blogs/slog/
(Accessed on: 13/09/09)

Appendix 2: Household expenditures on Khat and tobacco in Yemen

Relative Expenditure on Food, Qat and Tobacco. Household Budget Surveys 1992 and 1998 (at urban, rural and republic level)

	1992 Survey			1998 Survey		
Item	**Urban**	**Rural**	**Republic**	**Urban**	**Rural**	**Republic**
Cereals and their products	10.3	17.1	15.5	8.5	17.2	14.8
Legumes	1.9	1.8	1.8	1.4	1.3	1.3
Vegetables	5.9	4.6	4.9	6	4.6	5
Fruits	2.5	2.3	2.4	2.6	2.9	2.8
Meat, Poultry, Fish, Eggs	14.6	11.7	12.4	10.4	10.3	10.3
Milk and Dairy Products	3.4	3.3	3.3	3.6	5.5	5
Edible Fats and Oils	3.5	4.4	4.2	2.5	5.1	4.4
Sugar & its Products	4.4	5.6	5.3	2.8	5	4.4
Condiments & Spices	1.6	1.3	1.4	3.4	2	2.4
Tea, Coffee ,Cocoa	1.8	2.8	2.6	1.1	2.1	1.8
Mineral Water & Soda Drinks	1.1	1	1	1.1	0.8	0.9
Tobacco	3.3	3.2	3.2	2	2.2	2.1
Qat	9.5	7.9	8.3	8.7	8.5	8.6
Other non-Food Items & Luxuries & Services	36.2	33	33.7	45.9	32.5	36.2
Total	**100**	**100**	**100**	**100**	**100**	**100**

Source: Central Statistical Organization, Household Budget Survey 1996 and 1999

Appendix 3A: ELCHA Local Research Ethic Committee first approval

East London and The City Local Research Ethics Committee 1
Aneurin Bevan House, 81 Commercial Road, London E1 1RD
Telephone Number: 020 7 655 6718
Fax Number: 020 7 655 6655
Email Address: *Sandra.Burke@nelondon.nhs.uk*

Professor Ray Croucher
Head of Dental Public Health
Institute of Dentistry, Barts and The London (QMUL)
Turner St
London E1 2AD

23 January 2006

Dear Professor Croucher

Full title of study: **Correlates of khat chewing in Yemeni community**
REC reference number: **05/Q0603/195**

Thank you for your letter of 09 January 2006, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information was considered at the meeting of the Committee held on 12 January 2006. A list of the members who were present at the meeting is attached.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised.

a) Following the pilot period any substantial changes to the protocol would require Committee approval. Prof Croucher confirmed he would submit a substantial amendment where appropriate.

b) Confirmation that the researcher Dr Saba Salam would be chaperoned was required. Prof Croucher confirmed this would be the case.

c) Clarification of what was meant by 'community locations' and whether the safety of the researcher would be paramount as well as privacy of the participant could be maintained was requested. Prof Croucher explained that the locations would be equivalent to a pub or community centre and that the safety and privacy of both researcher and participant would be assured. In particular khat chewing amongst the Yemeni community was seen to be recreational and no stigma would be attached to the participant being seen with the researcher.

d) Assurances that once the study is concluded results would only be applied to the selected community and not necessarily applied to the national population of khat users. Prof Croucher confirmed that is was not his intention to compare data of the proposed research to any other community.

e) In the event that a Home Office ruling prohibits the use of khat or regulations change the environment in which it is used the Committee should be informed and shall review the implications before any continuation

f) The Committee made the following suggestions:
- Patient Information Sheet sections 7-10 were un-necessary and shou

removed.

- Section 14 of the patient information sheet should also be removed.
- In this instance GP's do not need to be informed of participation.

Conditions of approval

The favourable opinion is given provided that you comply with the conditions set out in the attached document. You are advised to study the conditions carefully.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Application		14 November 2005
Investigator CV		10 November 2005
Covering Letter		10 November 2005
Letter from Sponsor		11 November 2005
Peer Review		09 November 2005
Statistician Comments		11 November 2005
GP/Consultant Information Sheets	01	14 November 2005
Participant Information Sheet	01	14 November 2005
QMUL Sponsorship Agreement		10 November 2005
Research Protocol	01	14 November 2005
BLT Provisional Indemnity Letter		11 November 2005
Appendix 8 - Research pictorial leaflet		14 November 2005
Appendix 9 - Khat chewing amongst UK resident male Yemeni adults: an exploratory study.		14 November 2005
Appendix 1 - Research selection of population study		14 November 2005
Appendix 3 - Phase I interview questionnaire		14 November 2005
Appendix 5 - Phase II interview questionnaire		14 November 2005

Research governance approval

The study should not commence at any NHS site until the local Principal Investigator has obtained final research governance approval from the R&D Department for the relevant NHS care organisation.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

05/Q0603/195 **Please quote this number on all correspondence**

With the Committee's best wishes for the success of this project

Yours sincerely

P.P. Senior Administrator
A. T. Tucker BSc(Hons) PhD SRCS
Chairman
East London and The City Research Ethics Committee (1)

Appendix 3B: ELCHA Local Research Ethic Committee second approval

East London and The City Research Ethics Committee 1
Aneurin Bevan House, 81 Commercial Road, London E1 1RD
Telephone Number: 020 7 655 6718
Fax Number: 020 7 655 6655
Email Address: *Sandra.Burke@nelondon.nhs.uk*

Professor Ray Croucher
Head of Dental Public Health
Turner St
London E1 2AD

30 January 2007

Dear Professor Croucher

Study title: **Correlates of khat chewing in Yemeni community**
REC reference: **05/Q0603/195**

Amendment number: **1**
Amendment date: **04 January 2007**

The above amendment was reviewed at the meeting of the Sub-Committee of the REC held on 24 January 2007.

Ethical opinion

The members of the Committee present gave a favourable ethical opinion of the amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved at the meeting were:

Document	Version	Date
Consent for for saliva collection, with Arabic translation	01 (Arabic version 01)	04 January 2007
Information Sheet, with Arabic translation	03 (Arabic version 04)	04 January 2007
Research Protocol	03	04 January 2007
Summary of changes		
Notice of Substantial Amendment (non-CTIMPs)	1	04 January 2007
Covering Letter		04 January 2007

Membership of the Committee

The members of the Ethics Committee present at the meeting were Prof Atholl Johnston and Dr Chandan Alam.

Research governance approval

All investigators and research collaborators in the NHS should notify the R&D Department for the relevant NHS care organisation of this amendment and check whether it affects research governance approval of the research.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

05/Q0603/195:	**Please quote this number on all correspondence**

Yours sincerely

Sandra Burke
Senior Committee Co-ordinator
East London & The City Research Ethics Committees

Copy to: Mr Gerry Leonard

Appendix 4A: Research participant consent form

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7632
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughes@qmul.ac.uk

CONSENT FORM

Centre Number: _____
Study Number: _____
Patient Identification Number for this trial: _____

Title of Project: Correlates of khat chewing (Takzeen) in the Yemeni Community

Name of Researcher: **Professor Ray Croucher**

Please initial box

1. I confirm that I have read and understand the information sheet dated 04/01/07 (version 3) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that sections of any of my medical notes may be looked at by responsible individuals from Dental Public Health, Institute of Dentistry, Bart's and The London, Queen Mary's School of Medicine and Dentistry or regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records ☐
4. I agree to take part in the above study. ☐

_____	/ / _____	_____
Name of Patient	Date	Signature
_____	/ / _____	_____
Name of Person taking consent (if different from researcher)	Date	Signature
_____	/ / _____	_____
Researcher	Date	Signature

Appendix 4B: Research participant consent form (Arabic)

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7632
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughes@qmul.ac.uk

إستمارة موافقة

رقم المركز : _____
رقم الدراسة : _____

رقم المتطوع في هذه الدراسة : _____

عنوان الدراسة: تخزين القات وملازماته بين أبناء الجالية اليمنية

مشرف الدراسة: Professor Ray Croucher

رجاءً ضع إشارة في المربع

1. أقر بأني قرأت و فهمت إستمارة المعلومات المؤرخه بتاريخ 04 / 01 / 2007 (نسخة 4) للدراسة المذكورة أعلاه وأعطيت لي فرصه لطرح الأسئلة. ☐
2. إني أدرك أن مشاركتي في هذه الدراسة طوعيه ولي مطلق الحرية في الانسحاب منها في اي وقت من غير اعطاء الأسباب و هذا بالتالي لن يؤثر عليا. ☐
3. إني أدرك بأن مشاركتي في هذه الدراسة قد يطلع عليه من قبل الافراد المختصين في قسم وقاية الفم ومعهد الأسنان بجامعة كوين ميري وبعض الجهات المشرفة على هذه الدراسة. ☐
4. أوافق على الأشتراك في هذه الدراسة. ☐

_____	_____ / /	_____
أسم المتطوع	التاريخ	التوقيع
_____	_____ / /	_____
اسم الشخص الذي يأخذ الموافقة (إذا مختلف عن الباحث)	التاريخ	التوقيع
_____	_____ / /	_____
أسم الباحث	التاريخ	التوقيع

Appendix 4C: Research participant consent form for saliva collection

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7632
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughes@qmul.ac.uk

CONSENT FORM FOR SALIVA COLLECTION

Centre Number: _____
Study Number: _____
Patient Identification Number for this trial: _____

Title of Project: Correlates of khat chewing (Takzeen) in the Yemeni Community

Name of Researcher: **Professor Ray Croucher**

Please initial box

1. I confirm that I have read and understand the information sheet dated 04/01/07 (version 3) for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal rights being affected. ☐
3. I understand that sections of any of my medical notes may be looked at by responsible individuals from Dental Public Health, Institute of Dentistry, Bart's and The London, Queen Mary's School of Medicine and Dentistry or regulatory authorities where it is relevant to my taking part in research. I give permission for these individuals to have access to my records ☐
4. I agree to take part in the above study. ☐

_____	_____ / / _____	_____
Name of Patient	Date	Signature
_____	_____ / / _____	_____
Name of Person taking consent (if different from researcher)	Date	Signature
_____	_____ / / _____	_____
Researcher	Date	Signature

Appendix 4D: Research participant consent form for saliva collection (Arabic)

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7632
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughes@qmul.ac.uk

إستمارة موافقة إعطاء عينة لعاب

رقم المركز : _____
رقم الدراسة : _____
رقم المتطوع في هذه الدراسة : _____

عنوان الدراسة: تخزين القات وملازماته بين أبناء الجالية اليمنية

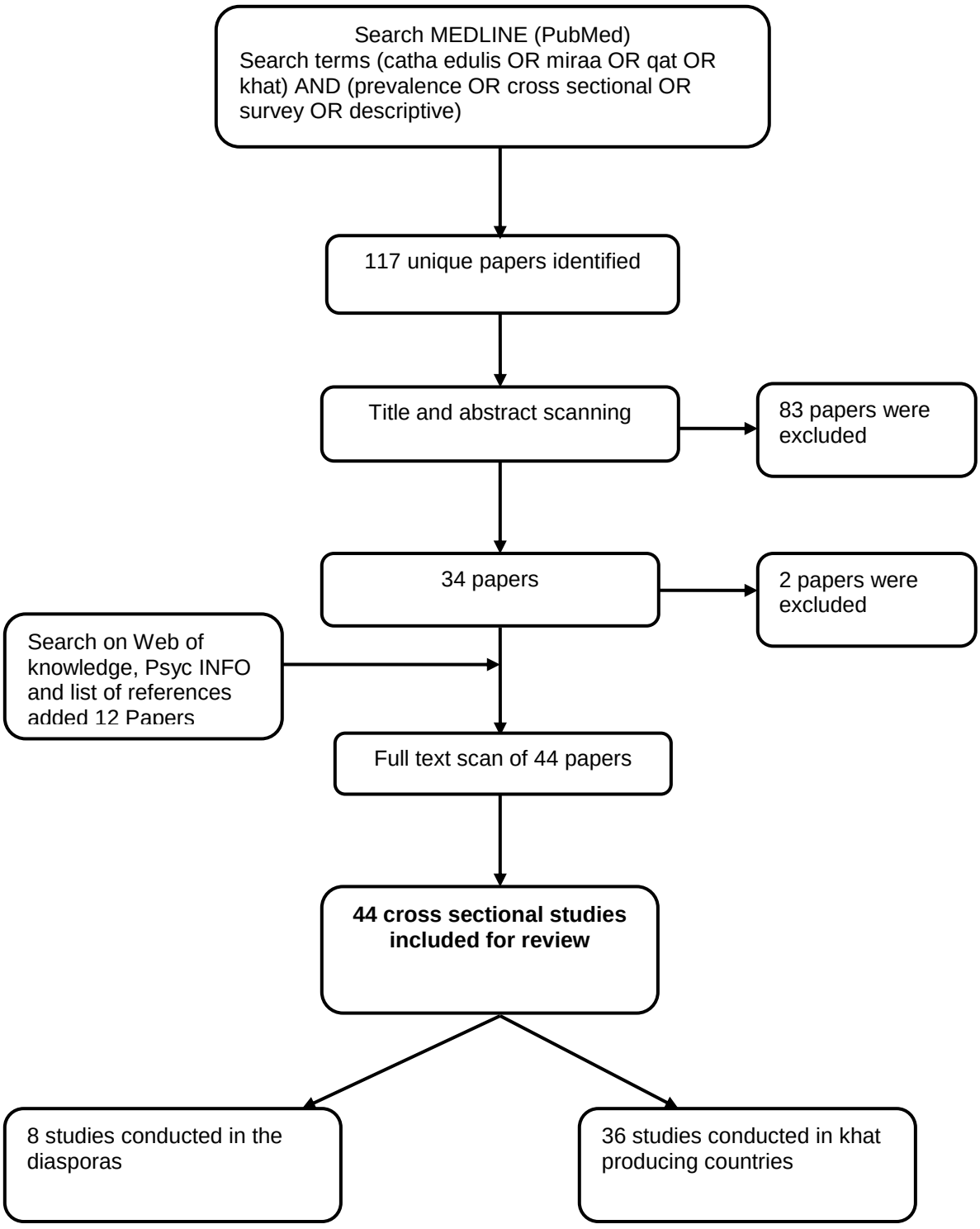
مشرف الدراسة: Professor Ray Croucher

رجاءً ضع إشارة في المربع

1. أقر بأني قرأت و فهمت إستمارة المعلومات المؤرخه بتاريخ 04 / 01 / 2007 (نسخة4) للدراسة المذكورة أعلاه وأعطيت لي فرصه لطرح الأسئلة. ☐
2. إني أدرك أن مشاركتي في هذه الدراسة طوعيه ولي مطلق الحرية في الانسحاب منها في اي وقت من غير اعطاء الأسباب و هذا بالتالي لن يؤثر عليا. ☐
3. إني أدرك بأن مشاركتي في هذه الدراسة قد يطلع عليه من قبل الافراد المختصين في قسم وقاية الفم ومعهد الأسنان بجامعة كوين ميري وبعض الجهات المشرفة على هذه الدراسة. ☐
4. أوافق على الأشتراك في هذه الدراسة. ☐

_____	/ / _____	_____
أسم المتطوع	التاريخ	التوقيع
_____	/ / _____	_____
اسم الشخص الذي يأخذ الموافقة (إذا مختلف عن الباحث)	التاريخ	التوقيع
_____	/ / _____	_____
أسم الباحث	التاريخ	التوقيع

Appendix 5A: Identifying the studies of khat chewing prevalence



Appendix 5B: Assessment of khat chewing prevalence studies

Altman (1999) criteria:

1-Was the source of the subjects clearly described? Yes – No (Not clear or No)

2-Was the method of selection of subjects clearly described (inclusion and exclusion criteria)? Yes – No (Not clear or No)

3-Was the sample size based on pre-study consideration of statistic power? Yes – No (Not clear or No)

4-Was the sample of subjects appropriate with regard to generalisability of the findings? Yes – No (Not clear or No)

5-Was the data instrument valid and reliable? Yes – No (Not clear or No)

6-Was the design of the study acceptable? Yes – No (Not clear or No)

7-Was satisfactorily high response rate achieved? Yes – No (Not clear or No)

8-Was there a statement adequately describing all statistics procedure used? Yes – No (Not clear or No)

Table 1: Assessment of studies using community samples of all age groups in Diasporas, UK and other countries

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistics procedure	Study design acceptable
Griffiths (1997),UK	Yes Community Somalia, London	No	No	No Privileged Access Interviewers (PAI)	No Face to face interview	No	No	Yes
Ahmed et al (1998), Uk	Yes Community Somalia ,Liverpool	No	No	No PAI	No Face to face interview	No	No	Yes
Bhui et al (2003), UK	Yes Somali community Greenwich, South London	No	No	Yes Random selection from community panel	No Face to face interview	Yes	No	Yes
Bhui et al (2006), UK	Yes Somali community of Tower and Hamlet Boroughs-UK	No	No	No	No Face to face interview	No	No	Yes
Wood (2005), Uk	Yes Somali community of Sheffield	No	No	No (PAI)	No Face to face interview	No	No	Yes
Patel et al (2005),Uk	Yes Somali community in Sheffield London Bristol, Liverpool	No	No	No (PAI)	No Face to face interview	No	No	Yes
Nabuzoka et al (2000),Uk	Yes Somali community in Sheffield	No	No	No	No Face to face interview	No	No	Yes
Litman et al (1986), Jerusalem	Yes Jewish Yemeni emigrants in two villages in Jerusalem	No	No	No	No Face to face interview	No	No	Yes

Table 2: Assessment of studies using community and national samples of all age groups in countries producing khat

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistics procedure	Study design acceptable
Alem et al (1999), Ethiopia	Yes Rural community Butijira in Ethiopia.	No	No	No (Random selection of houses referred to other paper which is not available)	No Face to face interview	Yes	No	Yes
Belew et al (2000), Ethiopian	Yes Rural and urban Ethiopian community	Yes	Yes	Yes (simple random sampling No of houses and direction if no number)	No Face to face interview	Yes	No	Yes
Ayana et al (2002), Ethiopia	Yes Jimma town, W.Ethiopia	No	Yes	Yes 10 kebeles out 20 were selected randomly and then 100 house from each kebeles	No Face to face interview	Yes	No	Yes
Selassie (1996) Ethiopia	Yes Ethiopia, Twenty-four towns.	No	No	No	No Face to face interview	No	No	Yes
Mwenesi (1996), Kenya	Yes Kenya, 22 districts	No	No	No	No Face to face interview	No	No	Yes
Numan (2004), Yemen	Yes Three urban and three rural areas in Yemen	No	No	No	No Face to face interview	No	No	Yes
World Bank (2007), Yemen	Yes Urban and rural areas in seven of Yemen's Governorates	No	No	No	No Face to face interview	No	No	Yes
Khawaja et al (2007),Yemen	Yes Survey data of Yemen Demographic and Maternal and Health Survey	No	No	Yes	No Face to face interview	Yes	No	Yes

Table 2: (Continued)

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistics procedure	Study design acceptable
Elmi (1983 b), Somalia	Yes Hargesia and Mogadishu town and neighborhoods, Somalia	No	No	No	No Face to face interview	No	No	Yes
Odenwald et al (2005), Somalia	Yes Hargesia, Somalia	No	No	No	No Face to face interview	No	No	Yes
Odenwald et al (2007a), Somalia	Yes Armed personnel in seven region of Somalia	No	No	No	No Face to face interview	No	Yes	Yes
Aden a et al (2006), Kenya	Yes Households in Ijara district North east Kenya	No	No	No	No Face to face interview	No	No	Yes
Tesfye et al (2008), Ethiopia	Yes 10 of 99 Addis Ababa kebeles	Yes	No	Yes	No Face to face interview	Yes	Yes	Yes

Table (3): Assessment of studies using clinical samples of all age groups in countries producing khat

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistics procedure	Study design acceptable
Ali et al (2004), Yemen	Yes Dental school in Sana'a.	No	No	No	No Face to face interview	No	No	Yes
Omolo et al (1987a), Kenya	Yes outpatient primary care in Meru area.	No	No	No	No Face to face interview	No	No	Yes
Mangel et al (1996), Yemen	Yes Schools, university, and private dental clinics in four locations in Yemen.	No	No	No	No Face to face interview	No	No	Yes
Hill and Gibson (1987), Yemen	Yes Outpatient of hospital.	No	No	No	No Face to face interview	No	No	Yes
Othieno et al (2000), Kenya	Yes Outpatients attending rural and urban health centres in Kenya.	No	No	No	No Face to face interview	No	No	Yes

Table (4): Assessment of studies using homogenous samples of younger age groups in countries producing khat

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistics procedure	Study design acceptable
Zein (1988), Ethiopia	Yes College of medical and Paramedical in NW Ethiopia.	No	No	No	No Face to face interview	No	No	Yes
Kebede (2002a), Ethiopia	Yes Four colleges of Gonder medical sciences in NW Ethiopia.	No	No	Yes	No Self-administered Questionnaire	Yes	No	Yes
Kassay et al (1999), Ethiopia	Yes One government school from the capital Addis Ababa and the other rural from Butajira. One private in Addis Ababa.	No	No	No	No Self-administered Questionnaire	No	No	Yes
Adugna et al (1994), Ethiopia	Yes Secondary schools' students Agaro, South West Ethiopia.	No	No	No	No Self-administered Questionnaire	No	No	Yes
Kebede et al (2005), Ethiopia	No	No	No	No	No Face to face interview	No	No	Yes
Ayana et al (2004), Ethiopia	Yes Jimma university students South West Ethiopia University	No	Yes	Yes	No Self-administered Questionnaire	Yes	No	Yes
Gelaw and HaileAmlak (2004), Ethiopia	Yes Jimma university staff South West Ethiopia	No	No	No	No Self-administered Questionnaire	Yes	No	Yes

Table (4): (continued)

Author, year and country of study	Subjects source clearly described	Sampling method	Sample size based on pre-study	Sample subjects generalizability	Data instrument valid and reliable	High response rate achieved	Statement adequately describing all statistical procedure	Study design acceptable
Ihunwo et al (2004), Uganda	No	No	No	No	No Self-administered Questionnaire	No	No	Yes
Taffa et al (2002),Ethiopia	Yes Youth in and out school in six zone of Addis Ababa	No	No	No	No Self-administered Questionnaire	Yes	No	Yes
Maru et al et al (2003), Kenya	Yes Children and young persons juvenile court in Nairobi ,Kenya	No	No	No	No Face to face interview	No	No	Yes
Alemu et al (2007), Ethiopia	Yes Bahir town in the northwest of Ethiopia	No	No	Yes	No Face to face interview	Yes	Yes	Yes
Gelaye et al (2008), Ethiopia	Yes Seventeen colleges's departments in Awassa.	No	No	No	No Self-administered Questionnaire	Yes	No	Yes
Arnold et al (2008), Ethiopia	Yes Seventeen colleges's departments in Awassa.	No	No	No	No Self-administered Questionnaire	Yes	No	Yes
Deyessa et al (2008), Ethiopia	Yes Women resided within the Butajira Rural Health Programme site	No	Yes	No	No Face to face interview	Yes	No	Yes
Molla et al (2008), Ethiopia.	Yes Youths resided within the Butajira Rural Health Programme site	No	No	No	No Face to face interview	Yes	No	Yes
Ross et al (2008), Tanzania	No	Yes	No	No	No Face to face interview	No	No	Yes
Laswar and Darwish (2009), Yemen	Yes Medical students in Aden university at five stages of training	No	No	No	No Face to face interview	Yes	No	Yes
Ageely (2009), Saudi Arabia.	Yes college and secondary school students in Jazan.	No	No	No	No Face to face interview	Yes	No	Yes

Appendix 5C: Number of criteria achieved by each study

1) In Diasporas **Community samples of all age groups**	
Author and year of study	Criteria achieved by the study
1. Griffiths et al (1997)	2
2. Ahmed et al(1998)	2
3. Bhui et al (2003)	4
4. Bhui et al (2006)	2
5. Wood (2005)	2
6. Patel et al (2005)	2
7. (Nabuzoka and Badhadhe (2000)	2
8. Litman et al (1986)	2
2) In khat producing countries **a) Community and National samples of all age groups:**	
1. Alem et al (1999)	3
2. Belew et al (2000)	6
3. Ayana et al (2002	5
4. Selassie (1996)	2
5. Mwenesi (1996)	2
6. Numan (2004)	2
7. World Bank (2007)	2
8. Khawaja et al (2007)	4
9. Elmi (1983 b)	2
10. Odenwald et al (2005)	2
11. Odenwald et al (2007a)	3
12. Aden et al (2006)	2
13. Tesfye et al (2008)	6
b) Clinical samples of all age groups	
1. Ali et al (2004)	2
2. Omolo et al (1987)	2
3. Mangel et al (1996)	2
4. Hill and Gibson (1987)	2
5. Othieno et al (2000)	2
C) Homogenous samples of younger age	
1. Zein (1988)	2
2. Kebede (2002)	4
3. Kassaye et al (1999)	2
4. Adugna et al (1994)	2
5. Kebede et al (2005)	1
6. Ayana et al (2004)	5
7. Gelaw et al 2004)	3
8. Ihunwo et al (2004)	1
9. Taffa et al (2002)	3
10. Maru et al (2003)	2
11. Alemu et al (2007	5
12. Gelaye et al (2008)	3
13. Arnold et al (2008)	3
14. Deyessa et al (2008)	4
15. Molla et al (2008)	3
16. Ross et al (2008)	2
17. Laswar and Darwish (2009)	3
18. Ageely (2009)	3

Appendix 6A: Screening Interview Questionnaire

Correlates of Khat Chewing (Takzeen) in the Yemeni Community

Introduction:
I am doing a research study about aspects of khat chewing (Takzeen) and associated behaviours such as tobacco use among the Yemeni community. To help me in this research, you will be asked a few questions about yourself. Your answers will be strictly confidential.

Name: _____

Country of origin: _____

Age: _____

Post Code _____ City: _____

Tel: _____ Mobil: _____

1. Do you regularly (weekly) chew (Takzeen) khat?
   - ☐ Yes
   - ☐ No
2. Do you have or suffer from any disabilities, mental health problems or chronic diseases?
   - ☐ Yes
   - ☐ No
3. Do you speak English or Arabic?
   - ☐ Yes
   - ☐ No
4. Are you a permanently resident in Sheffield-UK?
   - ☐ Yes
   - ☐ No

Thank you for your help

Appendix 6B: Screening Interview Questionnaire (Arabic)

تخزين القات وملازماته بين أبناء الجالية اليمنية

المقدمة:
أعمل دراسة بحث حول سمات مضغ (تخزين) القات والسلوك المرتبط مع مضغ (تخزين) القات مثل استعمال التبغ بين ابناء الجالية اليمنية. لمساعدتي في هذا البحث, سيُطرح عليكم بعض الأسئلة الشخصيه. أجوبتك ستكون موضع السرية التامة.

الأسم:_____

الموطن الأصلي :_____

العمر:_____

الرمز البريدي:_____المدينة :_____

الهاتف:_____الجوال: _____

1. هل تمضغ (تخزن) القات بإنتظام (إسبوعياً) ؟
   - ☐ نعم
   - ☐ لا

2. هل تعاني من أي مرض مزمن أو أي إعاقة جسدية او ذهنية ؟
   - ☐ نعم
   - ☐ لا

3. هل تتحدث اللغة الإنجليزية اوالعربية ؟
   - ☐ نعم
   - ☐ لا

4. هل تقيم بصفه دائمة في شفيلد - بريطانيا ؟
   - ☐ نعم
   - ☐ لا

شكراً على تعاونكم

Appendix 6C: Main Interview Questionnaire

Volunteer NO

Correlates of Khat Chewing (Takzeen) in the Yemeni Community

Introduction:
Please help me by answering some questions about aspects of khat chewing (Takzeen) and related behavior such as Tobacco use amongst the Yemeni Community.

Confidentiality:

All your answers will be completely confidential. Your name will not be put anywhere on this form. You do not have to answer any questions that you do not wish to, however please answer as many as you can. If you do not understand any of the questions, ask me to explain them in more details.

Date of Interview: ____ / ____ /2007

Time of Interview: _____

Location of Interview: _____

Comments: _____

SECTION 1. Demographic and Socio-culture Characteristics

In order to know a little bit about the people I am interviewing I have to ask you a few questions about yourself.

1) How old are you?
_____Years old

2) Which country and city/village were you born in?
Country: _____
City/village: _____

3) How long have you been living in the UK?
_____Years

4) What level of education have you completed and where?

□ Primary school	Yemen □	UK □	Other □
□ Secondary School	Yemen □	UK □	Other □
□ Higher School	Yemen □	UK □	Other □
□ Some college	Yemen □	UK □	Other □
□ Completed college	Yemen □	UK □	Other □
□ Some university	Yemen □	UK □	Other □
□ University degree	Yemen □	UK □	Other □

□ None
□ Other_____

5) Which language would you prefer most of the time to read in?
□ English
□ Arabic
□ Both Arabic & English
□ Other _____
□ Not applicable

6) *If you work,* which language do you speak most of the time at work?
□ English
□ Arabic
□ Both Arabic & English
□ Other_____
□ Not applicable

7) *At home*, what language do you speak most of the time?
□ English
□ Arabic
□ Both Arabic &English
□ Other_____
□ Not applicable

8) Are you currently?

- □ Employed full-time (30+hrs). Job name_____
- □ Employed part-time (less than 30hrs) Job name _____
- □ Unemployed and looking for work
- □ Out of work due to sickness/disability
- □ Retired from work Job before retirement _____
- □ Full/part-time student
- □ N/A

If unemployed

- How long have you been unemployed? _____
- How do you support yourself financially _____

9) Are you?

- □ Married Number of children _____
- □ Divorced/separated Number of children _____
- □ Widowed Number of children _____
- □ Unmarried/single

10) Who is your landlord?

- □ Council Number of bedrooms _____
- □ Housing Association Number of bedrooms _____
- □ Owned Number of bedrooms _____
- □ Privately rented Number of bedrooms _____
- □ Rented & Shared with other people Number of bedrooms _____
- □ N/A

11) How many other people live with you in the house/flat?

- □ No other people
- □ Number of other people, Adults _____
  Child _____
- □ N/A

12) Are most of the people in your neighbourhood friendly to you?

- □ Yes
- □ No
- □ N/A

13) Do you have a neighbour who is hostile/threatening to you or your family members?

- □ Yes
- □ No
- □ N/A

14) Can you give me your post code?

_____

SECTION 2. Social Participation

Now I would like to ask you a few questions about your contact with family and friends, and community participation in Sheffield.
In the past 12 months, how many times have you done the following monthly… ?

		Not at all	Once or twice	Three to six times	More than Six times	Not applicable
1.	Gone to visit family members					
2.	Had family visit you					
3.	Have spoken to relatives on phone					
4.	Gone out to visit Yemeni friends					
5.	Had Yemeni friends visit you					
6.	Have spoken to friends on phone					
7.	Gone to visit Yemeni neighbours					
8.	Had Yemeni neighbours visit you					
9.	Attended school parents meeting or assembly					
10.	Played sport / been to gym or exercise club/ been to adult or evening class					
11.	Attended political party or trade union meeting					
12.	Gone to mosque for prayer					
13.	Apart from khat chewing (takzeen) session, attended any Yemeni meetings					

SECTION 3. Health

SECTION 3.1 General Health

1) How would you describe your current state of health in general?

- □ V.good
- □ Good
- □ Fair
- □ Bad
- □ V. bad
- □ N/A

2) Do you have any health condition (s)?

- □ Yes please describe…….
- □ No
- □ N/A

SECTION 3.2 Oral Health

1) Do you have any oral problems such as pain /gum disease or any other?

- □ Yes please describe……...
- □ No
- □ N/A

2) Are you registered with a dentist/dental practice?

- □ Yes
- □ No Since when……..
- □ N/A

3) Do you personally go to the dentist?

- □ For regular check up for instance once or twice a year
- □ For an occasional check up for instance once every other year or less
- □ Only when in pain
- □ Never been/go to the dentist
- □ N/A

SECTION 4. Khat Chewing

1) Can I just check whether you are currently chewing khat (tekazeen) or not?

□ Yes
□ No *(If No terminate the interview.)*

2) What kind of khat do you usually chew (tekazeen)?

□ Herari
□ Yemeni
□ Mirra
□ Other _____

3) How old were you when you first chewed khat (tekazeen)?

_____Years old

4) Where did you first start chewing khat (tekazeen)?

□ Yemen
□ UK
□ Other_____

5) Who initiated your first chew of khat (tekazeen)?

□ Close friends
□ Casual acquaintances
□ Wife
□ Father
□ Mother
□ Other family member
□ Bought it yourself
□ Other_____

6) Was your father a khat chewer (mokazeen)?

□ Yes
□ No
□ N/A

7) Was your mother a khat chewer (mokazena)?

□ Yes
□ No
□ N/A

8) Are there any other khat chewers (mokazenin) living with you currently?

□ Yes
□ No
□ N/A

9) Do you have a close friend who chews (Mokazeen) khat currently?

□ Yes
□ No
□ N/A

10) Why do you chew khat (tokazeen) nowadays? *(Please choose from the following the most important factor)*

- □ A habit
- □ Social interaction
- □ Help pass the time
- □ Help concentration during study and work
- □ Isolation
- □ Dependence
- □ No alternatives for khat chewing
- □ Other_____

11) In general when you chew khat (tokazeen), are you ……?

- □ By yourself
- □ With others from your community
- □ Other
- □ N/A

12) How many days do you usually chew (tokazeen) per week now?

_____ day

13) Which days of the week do you usually chew (tokazen) khat?

□ Mondays	□ Wednesdays	□ Fridays	□ Sundays
□ Tuesdays	□ Thursdays	□ Saturdays	

14) Which chew (takzeena) would you most hate to give up?

□ Mondays	□ Wednesdays	□ Fridays	□ Sundays
□ Tuesdays	□ Thursdays	□ Saturdays	

15) At what time of the day do you usually start chewing khat (altakzeen)?

- □ 1-3 pm
- □ Between 3-6 pm
- □ Other_____

16) How much khat do you usually chew (tokazeen)?

_____ bundles/robta.

17) In the last 12 months, approximately how much khat do you chew (tokazeen) on a typical khat chewing day?

_____bundles/robta.

18) Do you chew (tokazeen) more khat during the first hours of a session rather than the rest of the session?

- □ Yes
- □ No
- □ N/A

19) When you chew Khat (tokazeen), how long will it take you to finish the first bundle?

- □ 30 minutes
- □ 1-2 hours
- □ More than 2 hours

20) When you chew (tokazeen), how long on average will a chewing session (Altakzeena) last?

_____Hours.

21) Do you chew (tokazeen) even if you are so ill that you are in bed much of the day?

- □ Yes
- □ No
- □ N/A

22) When you chew (tokazeen), do you usually swallow khat juice?

- □ Yes
- □ No
- □ N/A

23) How easy or difficult would you find it to go without chewing (takzeen) for a whole week?

- □ Very easy
- □ Fairly easy
- □ Fairly difficult
- □ Very difficult.

24) Do you want to give up chewing (altakzeen)?

- □ Yes *(go to Q 25)*
- □ No *(go to Q 26)*
- □ N/A *(go to Q 26)*

25) How much do you want to give up chewing (altakzeen) altogether?

- □ Slightly
- □ Moderate
- □ Quite strongly
- □ Very strongly
- □ N/A

26) Have you ever tried to give up chewing (altakzeen)?

- □ Yes Number of times tried to give up chewing:_____*(go to Q 27)*
- □ No *(go to Q 28)*
- □ N/A *(go to Q 28)*

27) Which is the most important of the following, made you re-start khat chewing (altakzeen)?

- □ Isolation from your community
- □ Depression
- □ Dependent
- □ Cannot work or study without it
- □ To avoid things not convenient to Muslims e.g. Alcohol….etc
- □ No alternatives for khat chewing
- □ Other _____

28) Have you ever received any education/information about khat and its effects?

- □ Yes *(go to Q29)*
- □ No *(go to the next section)*
- □ N/A *(go to the next section)*

29) Did you receive that education ……?

- □ At school
- □ In community center
- □ At mosque
- □ From Family
- □ Other _____

30) How did you receive that education ….. ?

- □ Posters
- □ Leaflets
- □ Lectures
- □ Other _____

SECTION 5. Severity of Dependence on Khat (SDS-khat Gossop et al., 1995)

In the last 12 months,

1) Did you ever think that your khat chewing ((altakzeen) was out of control?

Never or almost never	Sometimes	Often	Always or nearly always

2) Did the prospect of not chewing (takzeen) any khat make you anxious or worried?

Never or almost never	Sometimes	Often	Always or nearly always

3) Did you worry about your khat chewing (altakzeen)?

Never or almost never	Sometimes	Often	Always or nearly always

4) Did you wish you could stop chewing khat (altakzeen)?

Never or almost never	Sometimes	Often	Always or nearly always

5) How difficult would you find it to stop or go without khat chewing (altakzeen)?

Not difficult	Quite difficult	Very difficult	Impossible

SECTION 6. Tobacco Use

1) Are you currently a regular tobacco user?
- □ Yes (*if Yes go to Q 2)*
- □ No (*if No go to Section 6.2 Tobacco use with Khat chewing only)*

2) Excluding the last 12 months, have you ever been a regular user of the following products?
- □ Cigarettes
- □ Cigar
- □ Shisha
- □ Cigarettes and Shisha
- □ Other _____
- □ None of the above

3) Which of the following is currently your primary tobacco product?
- □ Cigarettes *(go to Section 6.1 and 6.1.1)*
- □ Cigar *(go to Section 6.1 and 6.1.1)*
- □ Shisha *(omitted)*
- □ Cigarette and shisha *(omitted)*
- □ Other _____ *(omitted)*

SECTION 6.1 Cigarette and Cigar Smoking

1) How old were you when you first start smoking cigarettes?
_____Years old

2) Where did you start smoking?
- □ Yemen
- □ UK
- □ Other _____

3) Who of the following initiated your cigarette smoking?
- □ Friends
- □ Family
- □ Khat chewing (altakzeen)
- □ Other_____

4) Do you have a close friend who currently smokes cigarettes?
- □ Yes
- □ No
- □ N/A

5) Does your partner/wife smoke cigarettes currently?
- □ Yes
- □ No
- □ N/A

6) Was your mother a regular cigarette smoker?

- □ Yes *(go to Q8)*
- □ No *(go to Q7)*
- □ N/A *(go to Q8)*

7) Did your mother use other tobacco products?

- □ Yes Type of tobacco: _____
- □ No
- □ N/A

8) Was your father a regular cigarette smoker?

- □ Yes *(go to Q10)*
- □ No *(go to Q9)*
- □ N/A *(go to Q10)*

9) Did your father use other tobacco products?

- □ Yes Type of tobacco _____
- □ No
- □ N/A

10) When you chew khat (takazeen) are you ….?

- □ Much more likely to smoke cigarettes Number of Cig: _____
- □ More likely to smoke cigarettes Number of Cig: _____
- □ Likely to smoke cigarettes just the same
- □ Less likely to smoke cigarettes Number of Cig: _____
- □ Much less likely to smoke cigarettes Number of Cig: _____
- □ N/A

11) Has the number of cigarettes smoked currently during a khat session compared to 12 months ago…..?

- □ Increased
- □ Decreased
- □ Remained at same level
- □ N/A

12) Do you smoke more cigarette/cigar during the first hours of a khat session rather than the rest of the session?

- □ Yes
- □ No
- □ N/A

13) After spitting khat, do you continue smoking?

- □ Yes
- □ No
- □ N/A

14) Can I know why you smoke cigarette/cigar when you chew khat (takazeen)?

_____

SECTION 6. 1.1 Fagerstrom Test for Nicotine Dependence (Heatherton et al., 1991)

1) How many cigarettes per day do you smoke?
- □ 10 or less
- □ 11-20
- □ 21-30
- □ 31 or more

2) How soon after you wake do you smoke your first cigarette?
- □ Within 5 minutes
- □ 6-30 minutes
- □ 31-60 minutes
- □ 60^{+} minutes

3) Which cigarette would you most hate to give up?
- □ The first one in the morning/after waking up
- □ All others

4) Do you smoke more frequently during the first hours after waking than during the rest of the day?
- □ Yes
- □ No
- □ N/A

5) Do you smoke cigarettes even if you are so ill that you are in bed much of the day?
- □ Yes
- □ No
- □ N/A

6) Do you find it difficult to refrain from smoking in places where it is forbidden, such as Mosque, library, or cinema?
- □ Yes
- □ No
- □ N/A

7) How easy or difficult would you find it to go without smoking for a whole day?
- □ Very easy
- □ Fairly easy
- □ Fairly difficult
- □ Very difficult.

8) Do you want currently to give up smoking cigarettes?
- □ Yes (if Yes go to Q9)
- □ No (if No go to Q10)
- □ N/A (if No go to Q10)

9) How much do you want to give up cigarette smoking altogether?

- □ Slightly
- □ Moderate
- □ Quite strongly
- □ Very strongly
- □ N/A

10) Have you ever tried to give up cigarette smoking?

- □ Yes Number of times tried to give up smoking: _____
- □ No
- □ N/A

11) If you smoke cigarettes & shisha during khat chewing (takzeen), do you smoke your own shisha?

- □ Yes Number of Bowri _____
- □ No (*go to Q.12)*
- □ N/A (*go to Q.12)*

12) Do you share this shisha with others?

- □ Yes
- □ No
- □ N/A

(Before ending the interview please go to SECTION 6.3)

SECTION 6.2 Tobacco use with khat chewing (takzeen) only

1) Do you use tobacco currently during khat chewing (takzeen)?

□ Yes *(If Yes go to Q2)*
□ No *(if No go to Section 6.3 for saliva collection)*

2) Were you ever in life a regular user of the following tobacco products?

□ Cigarettes
□ Cigar
□ Shisha
□ Cigarettes and Shisha
□ Other _____

□ None of the above

3) Can I just check which of the following you consider currently your primary tobacco product?

□ Cigarette (*go to Q4*)
□ Cigar (*go to Q4)*
□ Shisha (*go to Q5)*
□ Dual (Cigarettes/cigar and shisha) (*go to Q4 & Q5*)

4) How many cigarette/cigar do you currently smoke in a khat session?

_____Cigarette / _____Cigar (for cigarette smokers go to Q7)

5) If you smoke shisha, do you smoke your own shisha?

□ Yes Number of Bowri _____ (*go to Q7)*
□ No (*go to Q.6)*
□ N/A (*go to Q.7)*

6) Do you share shisha with others?

□ Yes
□ No
□ N/A

7) Do you smoke more cigarette/cigar or shisha during the first hours of a khat session rather than the rest of the session?

□ Yes
□ No
□ N/A

8) Has the number of cigarette/cigar or bowri smoked currently during a khat session compared to 12 months ago…..?

□ Increased
□ Decreased
□ Remained at same level
□ N/A

9) Who of the following initiated your smoking cigarette/cigar or shisha use?

- □ Friends
- □ Family
- □ Khat chewing (takzeen)
- □ Other_____

10) After spitting khat, do you continue smoking cigarette/cigar or shisha?

- □ Yes
- □ No
- □ N/A

11) Have you ever tried to give up cigarette/cigar or shisha when you chew khat?

- □ Yes Number of times to give up tobacco smoking: _____
- □ No
- □ N/A

12) Can I know why you smoke cigarette/cigar or shisha when you chew khat?

_____

_____

(Please go to SECTION 6.3 to collect saliva and CO samples)

SECTION 6.3 Saliva collection and Carbon monoxide (CO) recording

Can you please give a small saliva sample…?

Saliva collected:

- □ Yes Saliva No: _____
- □ No

Can you blow inside this device…?

- □ Yes CO Score: _____
- □ No

Thank you for your help

Appendix 6D: Main Interview Questionnaire (Arabic)

رقم المتطوع			

تخزين القات وملازماته بين أبناء الجالية اليمنية

مقدمة:

أرجو منك مساعدتي بالإجابة على بعض الأسئلة حول تخزين القات والسلوك المرتبط به كتدخين التبغ بين أبناء الجالية اليمنية.

الخصوصية والسرية:

كل أجوبتك ستكون موضع السرية التامة. لن يظهر اسمك في أي مكان من هذه الاستمارة. لا يتحتم عليك الإجابة على أي سؤال لا تود الإجابة عليه، ولكن أرجو منك الإجابة على أكبر قدر ممكن من الأسئلة. في حالة عدم فهمك أي سؤال لا تتردد بطلب الإيضاح وسأجيبك بشرحٍ مفصل.

- تاريخ المقابلة: __________\ 2007 م
- وقت المقابلة :_____
- موقع المقابلة:_____
- التعليقـــات:_____

قسم 1. الخصائص الاجتماعية والديمُغرافية

من أجل معرفة أفضل عن المشارك المتطوع ، لا بد من طرح بعض الأسئلة الشخصية.

1) كم عمرك؟ _____

2) مكان الولادة البلد والمدينة/ القرية؟

البلد : _____

المدينة / القرية : _____

3) منذ كم سنة تعيش في بريطانيا؟

سنوات _____

4) ما هو المستوى التعليمي الذي أتممته، وأين؟

☐ التعليم الابتدائي	☐ اليمن	☐ بريطانيا	☐ مكان آخر
☐ التعليم الإعدادي	☐ اليمن	☐ بريطانيا	☐ مكان آخر
☐ التعليم الثانوي(لم أتممه)	☐ اليمن	☐ بريطانيا	☐ مكان آخر
☐ التعليم الثانوي	☐ اليمن	☐ بريطانيا	☐ مكان آخر
☐ التعليم الجامعي(لم أتممه)	☐ اليمن	☐ بريطانيا	☐ مكان آخر
☐ التعليم الجامعي(أتممه)	☐ اليمن	☐ بريطانيا	☐ مكان آخر

☐ لا يوجد

☐ جواب آخر

5) أي لغة تفضل للقراءة بها أغلب الوقت ؟

☐ الإنجليزية

☐ العربية

☐ كلاهما الإنجليزية والعربية

☐ جواب آخر_____

☐ لا ينطبق

6) إذا تَعمل، أي لغة تتكلم أغلب الوقت في العمل؟

☐ الإنجليزية

☐ العربية

☐ كلاهما العربية والإنجليزية

☐ جواب آخر_____

☐ لا ينطبق

7) في البيت، بأي لغة تَتكلّم أغلب الوقت ؟

☐ الإنجليزية

☐ العربية

☐ كلاهما العربية والانجليزية

☐ أخرى _____

8) (مهنيا) ،هل أنت حالياً؟

- ☐ تعمل دواماً كاملاً (+30 ساعة) نوع العمل: _____
- ☐ أعمل نصف دوام (أقل من 30 ساعة) نوع العمل: _____
- ☐ بدون عمل وأنتظر الحصول على عمل
- ☐ بدون عمل نتيجة لمرض أو عدم القدرة على العمل
- ☐ متقاعد من العمل نوع العمل قبل التقاعد: _____
- ☐ طالب ومتفرغ للدراسة
- ☐ لا إجابة

إذا كنت بدون عمل (عاطل عن العمل):

- لمدة كم من الزمن أنت عاطل عن العمل ؟ _____
- كيف تعيل نفسك مادياً؟ _____

9) هل أنت؟

- ☐ متزوج كم عدد الأبناء: _____
- ☐ مطلق/ منفصل كم عدد الأبناء: _____
- ☐ أرمل كم عدد الأبناء: _____
- ☐ عازب

10) من هو صاحب ملكية سكنك ؟

- ☐ المجلس المحلى عدد غرف النوم _____
- ☐ جمعية الإسكان عدد غرف النوم _____
- ☐ مُمتَلك عدد غرف النوم _____
- ☐ مُستَأجر بشكل خاص عدد غرف النوم _____
- ☐ أستأجر وأشترك مع أناس آخرين عدد غرف النوم _____
- ☐ بدون جواب

11) كم عدد الأفراد الذين يعيشون معك في المنزل / الشقة؟

- ☐ لا أحد
- ☐ آخرون، من الكبار _____
  من الأطفال _____
- ☐ بدون جواب

12) هل أغلب الناس في حارتك ودودين/ لطفاء معك؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

13) هل عندك جار يؤذيك أو يهددك أنت أو أفراد عائلتك؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

14) هل ممكن إعطائي رمزك البريدي؟

_____

قسم 2. <u>النشاط الاجتماعي</u>

الآن أريد أن أسألك بعض الأسئلة حول اتصالاتك مع أفراد عائلتك، أصدقائك، جيرانك وأنشطتك أو مشاركاتك الاجتماعية في شفيلد.

في الشهور الـ12 الماضية، كم هي عدد المرات في الشهر التي .....

		أبداً على الإطلاق	مرة أو مرتين	من 3 إلى 6 مرات	أكثر من 6 مرات	لا ينطبق
1)	**ذهبت لزيارة أفراد من عائلتك؟**					
2)	**زارتك عائلتك؟**					
3)	**تحدثت مع الأقرباء عبر الهاتف؟**					
4)	**ذهبت لزيارة أصدقاء يمنيين؟**					
5)	**زارك أصدقاؤك اليمنيون؟**					
6)	**تحدثت مع الأصدقاء عبر الهاتف؟**					
7)	**زرت جيرانك اليمنيين؟**					
8)	**قاموا جيرانك اليمنيون بزيارتك؟**					
9)	**حضرت الاجتماعات المدرسية لأولياء الأمور أو الفعاليات المدرسية؟**					
10)	**لعبت رياضة، ذهبت إلى نادي رياضي، حضرت دورات تعليم الكبار أو الدراسة المسائية ؟**					
11)	**حضرت اجتماعات للأحزاب السياسية أو النقابات العمالية؟**					
12)	**ذهبت إلى المسجد للصلاة؟**					
13)	**حضرت فيها اجتماعات يمنية، ماعدا جلسات القات ؟**					

قسم 3. الصحة

3.1 الصحة العامة

1) حالياً، كيف تصف حالتك الصحية بشكل عام؟

- ☐ جيدة جداً
- ☐ جيدة
- ☐ لا بأس
- ☐ سيئة
- ☐ سيئة جداً
- ☐ بدون جواب

2) هل لديك أي مشاكل صحية؟

- ☐ نعم اذكرها _____
- ☐ لا
- ☐ بدون جواب

3.2 صحة الفم

1) هل لديك أي مشاكل في الفم مثل الألم أو أمراض اللثة أو أي مرض آخر؟

- ☐ نعم اذكرها _____
- ☐ لا
- ☐ بدون جواب

2) هل أنت مسجل لدى طبيب أسنان أو عيادة أسنان؟

- ☐ نعم
- ☐ لا منذ متى _____
- ☐ بدون جواب

3) هل تذهب شخصياً إلى طبيب الأسنان .....؟

- ☐ للفحص الدوري مرة إلى مرتين في السنة
- ☐ أحياناً للفحص مرة مابين السنة والأخرى أو أقل
- ☐ فقط عندما يكون عندك ألم في الفم
- ☐ أبداً لا أذهب
- ☐ بدون جواب

قسم 4. تخزين القات

1) هل بالإمكان التأكد منك إذا كنت من مخزنين القات أولا؟

☐ نعم
☐ لا *(إذا كان لا أنهي المقابلة)*

2) أي نوع من القات تخزن دائماً ؟

☐ الهرري
☐ اليمني
☐ ميرا
☐ جواب آخر _____

3) كم كان عمرك عندما بدأت أول مرة تخزين القات؟

_____ سنة

4) أين بدأت تخزين القات أول مرة ؟

☐ اليمن
☐ بريطانيا
☐ مكان آخر _____

5) من علمك تخزين القات ؟

☐ الأصدقاء الحميمين
☐ بعض المقربين
☐ الزوجة
☐ الأب
☐ الأم
☐ بعض أفراد العائلة
☐ مني شخصياً
☐ من آخرين _____

6) هل كان والدك من مخزني القات؟

☐ نعم
☐ لا
☐ بدون جواب

7) هل كانت والدتُك من مخزني القات؟

☐ نعم
☐ لا
☐ بدون جواب

8) حالياً، هل هناك آخرون يعيشون معك من مخزني القات؟

☐ نعم
☐ لا
☐ بدون جواب

9) حالياً، هل عندك صديق حميم من مخزنين القات ؟

☐ نعم
☐ لا
☐ بدون جواب

10) حاليا، في الوقت الحاضر، لماذا تخزن القات؟ (إذا سمحت اختر من التالي العامل الأهم)

- ☐ عادة
- ☐ للتواصل الاجتماعي
- ☐ لتضييع الوقت
- ☐ يساعد على التركيز أثناء العمل أو الدراسة
- ☐ الشعور بالعزلة
- ☐ إدمان
- ☐ لا بدائل لتخزين القات
- ☐ أسباب أخرى _____

11) عموما عندما تخزن القات، هل تخزن.....؟

- ☐ وحدك
- ☐ مع آخرين من جاليتك
- ☐ جواب أخر
- ☐ بدون جواب

12) حالياً، كم عدد الأيام التي تخزن فيها القات في الأسبوع ؟

_____

13) ما هي أيام الأسبوع التي تخزن فيها القات عادةً؟

☐ الاثنين ☐ الثلاثاء ☐ الأربعاء ☐ الخميس
☐ الجمعة ☐ السبت ☐ الأحد

14) ما هو اليوم الذي تكره فيه الامتناع عن تخزين القات (يومك المفضّل لتخزين القات)؟

☐ الاثنين ☐ الثلاثاء ☐ الأربعاء ☐ الخميس
☐ الجمعة ☐ السبت ☐ الأحد

15) ما هو الوقت الذي تبدأ فيه تخزين القات عادةً؟

- ☐ بين الساعة الواحدة والثالثة مساءً
- ☐ بين الساعة الثالثة والسادسة مساءً
- ☐ جواب آخر _____

16) كم عدد ربط القات التي تخزنها عادةً؟

_____ ربطة

17) خلال الإثنى عشر شهراً الماضية، تقديرياً، كم عدد ربط القات التي كنت تخزنها في اليوم الواحد؟

_____ ربطة

18) هل تخزن كمية اكبر من القات في الساعات الأولى من جلسة القات عن بقية الساعات الأخرى ؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

19) حين تخزن القات، كم من الوقت تستغرق لتنتهي من تخزين الربطة الأولى؟

- ☐ 30 دقيقة
- ☐ من ساعة واحدة إلى ساعتين
- ☐ أكثر من ساعتين

20) حين تخزن القات، كم من الوقت تستغرق جلسة تخزين القات؟

_____ ساعة

21) هل تخزن القات حتى إذا كنت مريضاً جداً وطريح الفراش طوال اليوم؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

22) حين تخزن القات، هل تبلع لعابك؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

23) هل تجده سهلاً أو صعباً عندما تتوقف عن تخزين القات أسبوعاً كاملاً ؟

- ☐ إلى حد ما سهلاً
- ☐ سهلاً جداً
- ☐ إلى حد ما صعباً
- ☐ صعباً جداً

24) هل تحب الإقلاع عن تخزين القات؟

- ☐ نعم (أذهب إلى السؤال رقم 25)
- ☐ لا (أذهب إلى السؤال رقم 26)
- ☐ بدون جواب (أذهب إلى السؤال رقم 26)

25) إلى أي مدى تحب الإقلاع عن تخزين القات نهائياً ؟

- ☐ قليلا
- ☐ متوسط (معتدل)
- ☐ كثيراً
- ☐ كثيراً جداً
- ☐ بدون جواب

26) هل سبق أن حاولت الإقلاع عن تخزين القات؟

- ☐ نعم عدد مرات محاولة الإقلاع عن مضغ القات_____(أذهب إلى السؤال رقم 27)
- ☐ لا (أذهب إلى السؤال رقم 28)
- ☐ بدون جواب (أذهب إلى السؤال رقم 28)

27) من العوامل الآتية، ما هو العامل الأكثر أهمية الذي جعلك تعاود تخزين القات؟

- ☐ العزلة من جاليتك
- ☐ الكآبة
- ☐ الإدمان للقات
- ☐ لا أستطيع العمل أو الدراسة بدون القات
- ☐ لتفادي الأشياء غير المناسبة للمسلم كشرب الكحول
- ☐ لا بدائل لمضغ القات
- ☐ أخرى _____

28) هل تلقيت أي توعية/معلومات بخصوص القات وتأثيراته؟

□ نعم (أذهب إلى السؤال رقم 29)
□ لا (أذهب إلى القسم التالي)
□ بدون جواب (أذهب إلى القسم التالي)

29) هل تلقيت هذه التوعية/المعلومات .....؟

□ في المدرسة
□ في مقر الجالية
□ في المسجد
□ من العائلة
□ مصادر أخرى _____

30) كيف تلقيت تلك التوعية/المعلومات ؟

□ الملصقات
□ المنشورات
□ المحاضرات
□ مصادر أخرى _____

قسم 5. مقياس شدة إدمان القات (SDS-Khat-Gossop et al.,1995)

في الشهور الـ12 الأخيرة ...

1) هل سبق لك أن اعتقدت بأن تخزينك للقات خارج عن السيطرة ؟

أبداً أو تقريباً أبداً	أحياناً	أغلب الأحيان	دائماً أو تقريباً دائماً

2) هل كان ينتابك الشعور بالقلق أو الاضطراب عند التفكير بعدم تخزينك للقات؟

أبداً أو تقريباً أبداً	أحياناً	أغلب الأحيان	دائماً أو تقريبا دائماً

3) هل أنتابك القلق من تخزينك للقات؟

أبداً أو تقريباً أبَداً	أحياناً	أغلب الأحيان	دائماً أو تقريباً دائماً

4) هل تمنيت أن تكون قادراً على الإقلاع عن تخزين القات؟

أبداً أو تقريباً أبَداً	أحياناً	أغلب الأحيان	دائماً أو تقريباً دائماً

5) ما مدى الصعوبة التي كنت ستلاقيها عند الإقلاع أو التوقف عن تخزين القات؟

ليس صعب	إلى حد ما صعب	صعب جداً	مستحيل

قسم 6. استخدام التبغ

1) حالياً، هل أنت مستخدم منتظم للتبغ؟

□ نعم (إذا كان الجواب بنعم فأذهب إلى السؤال رقم 2)
□ لا (إذا كان الجواب بالنفي فأذهب إلى قسم (2-6) استخدام التبغ مع القات فقط)

2) ماعدا الشهور الـ12 الأخيرة، هل كنت مستخدم منتظم لإحدى منتجات التبغ التالية؟

□ السجاير
□ السيجار (أي الشروت الكوبي)
□ الشيشة
□ السجاير والشيشة
□ أخرى _____
□ لا شيء من المذكور أعلاه

3) حالياً، أي من المنتجات (التبغ) التالية تبغُك الأساسي؟

□ السجاير (أذهب إلى قسم 1-6)
□ السيجار - (أذهب إلى قسم 1 6)
□ الشيشة (الغُي)
□ السجاير والشيشة (الغُي)
□ أخرى

قسم 6.1. تدخين السجائر والسيجار

1) كم كان عمرك عندما بدأت تدخين السجائر ؟

_____ سنة

2) أين بدأت التدخين؟

□ اليمن
□ بريطانيا
□ أخرى

3) من علمك تدخين السجائر ؟

□ أصدقائك
□ عائلتك
□ تخزين القات
□ جواب أخر _____

4) حالياً، هل عندك صديق حميم يدخن السجائر؟

□ نعم
□ لا
□ بدون جواب

5) حالياً، هل شريكك/ زوجتك تدخن سجائر ؟

□ نعم
□ لا
□ بدون جواب

6) هل كانت والدتك تدخن السجائر بانتظام؟

□ نعم (أذهب إلى السؤال رقم 8)
□ لا (أذهب إلى السؤال رقم 7)
□ بدون جواب (أذهب إلى السؤال رقم 8)

7) هل كانت والدتك تدخن منتجات أخرى من التبغ ؟

□ نعم (أي نوع من التبغ _____)
□ لا
□ بدون جواب

8) هل كان والدك يدخن سجائر بانتظام ؟

□ نعم (أذهب إلى السؤال رقم 10)
□ لا (أذهب إلى السؤال رقم 9)
□ بدون جواب (أذهب إلى السؤال ر قم 10)

9) هل كان والدك يدخن منتجات أخرى من التبغ؟

□ نعم (أي نوع من التبغ _____)
□ لا
□ بدون جواب

10) عندما تخزن القات هل أنت؟

□ تدخن سجائر كثيراً جداً عدد السجائر _____
□ تدخن سجائر كثيراً عدد السجائر _____
□ تدخن نفس عدد السجائر
□ تدخن سجائر أقل عدد السجائر _____
□ تدخن سجائر أقل بكثير عدد السجائر _____
□ بدون جواب

11) حالياً، هل عدد السجائر التي تدخنها خلال تخزين القات مُقارنةً إلى قبل 12 شهراً الماضية؟

□ زاد
□ نقص
□ بَقى في المستوى نفسه
□ بدون جواب

12) هل تدخن سجائر/ سيجار أكثر في الساعات الأولى من جلسة القات عن بقية الساعات الأخرى ؟

□ نعم
□ لا
□ بدون جواب

13) عندما تنتهي من تخزين القات هل تستمر في تدخين السجائر؟

□ نعم
□ لا
□ بدون جواب

14) هل بالإمكان معرفة لماذا تدخن السجائر / السيجار عندما تخزن القات؟

_____

قسم 6.1.1. اختبار فاجرستروم لادمان النيكوتين (Heatherton et al., 1991)

1) كم عدد السجائر التي تدخنها في اليوم الواحد؟

- ☐ 10 سجائر أو أقل
- ☐ 11–20 سيجارة
- ☐ 21 -30 سيجارة
- ☐ 31 سيجارة أو أكثر

2) متى تدخن السيجارة الأولى بعد استيقاظك من النوم مباشرة ؟

- ☐ خلال 5 دقائق
- ☐ ما بين 6–30 دقيقة
- ☐ ما بين31–60 دقيقة
- ☐ 60 دقيقة وما بعد

3) أي سيجارة التي تكره الامتناع عنها ؟

- ☐ السيجارة الأولى في الصباح/ بعد استيقاظك من النوم
- ☐ أي سيجارة تلي السيجارة الأولى(أخرى)

4) هل تدخن أكثر في الساعات الأولى بعد استيقاظك من النوم عن بقية اليوم؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

5) هل تدخن السجائر حتى لو كنت مريضاً جداً وطريح الفراش؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

6) هل تجد صعوبة في الامتناع عن التدخين في الأماكن الممنوعة مثل المسجد، المكتبة أو السينما؟

- ☐ نعم
- ☐ لا
- ☐ بدون جواب

7) هل تجده سهلاً أو صعباً عندما تمتنع عن التدخين لليوم الواحد كاملاً؟

- ☐ سهل جداً
- ☐ سهل
- ☐ صعب
- ☐ صعب جداً

8) حالياً، هل ترغب في الإقلاع عن تدخين السجائر؟

- ☐ نعم (أذهب إلى السؤال رقم 9)
- ☐ لا (أذهب إلى السؤال رقم 10)
- ☐ بدون جواب (أذهب إلى السؤال رقم 10)

9) إلى أي مدى تحب الإقلاع عن تدخين السجائر نهائيا؟

- □ قليلا
- □ متوسط (معتدل)
- □ كثيراً
- □ كثيراً جداً
- □ بدون جواب

10) هل سبق أن حاولت الإقلاع عن تدخين السجائر؟

- □ نعم (كم مرة حاولت الإقلاع عن التدخين _____)
- □ لا
- □ بدون جواب

11) إذا كنت تدخن السجائر والشيشة مع تخزينك للقات ، هل تدخن شيشتك الخاصة؟

- □ نعم (كم عدد البواري _____)
- □ لا (أذهب إلى س 12)
- □ بدون جواب (أذهب إلى س 12)

12) هل تشارك الآخرين تدخين الشيشة ؟

- □ نعم
- □ لا
- □ بدون جواب

(قبل انهاء المقابلة يرجئ الذهاب الى قسم 6.3)

قسم 6.2. استعمال التبغ مع تخزين القات فقط

1) حالياً، هل تدخن التبغ أثناء تخزينك للقات؟

☐ نعم (أذهب إلى السؤال رقم 2)
☐ لا (أذهب إلى قسم جمع اللعاب 6.3)

2) هل كنت مستخدم منتظم لإحدى منتجات التبغ التالية؟

☐ السجاير
☐ السيجار (مثل الشروت الكوبي)
☐ الشيشة
☐ السجاير والشيشة
☐ أخرى _____
☐ لا شيء من المذكور أعلاه

3) حالياً، أي من المنتجات (التبغ) التالية تبغُكَ الأساسي؟

☐ السجاير (أذهب إلى س4)
☐ السيجار (أذهب إلى س4)
☐ الشيشة (أذهب إلى س5)
☐ السجاير والشيشة (أذهب إلى س 4 و5)

4) كم عدد السجائر / السيجار التي تدخنها أثناء تخزين القات؟

عدد السجائر _____/ السيجار _____ (إذا كان مدخن السجائر/ السيجار أذهب إلى س 7)

5) إذا كنت تدخن الشيشة، هل تدخن شيشتك الخاصة ؟

☐ نعم (كم عدد البواري _____)
☐ لا (أذهب إلى س 6)
☐ بدون جواب (أذهب إلى س7)

6) هل تشارك الآخرين تدخين الشيشة ؟

☐ نعم
☐ لا
☐ بدون جواب

7) هل تدخن السجائر/السيجار أو الشيشة أكثر في الساعات الأولى من جلسة القات عن بقية الساعات الأخرى؟

☐ نعم
☐ لا
☐ بدون جواب

8) حالياً، هل عدد السجائر / السيجار أو البواري التي تدخنها خلال تخزينك للقات مُقارنةً بما قبل الـ12 شهراً الماضية:

☐ زاد
☐ نقص
☐ بَقى في المستوى نفسه
☐ بدون جواب

9) من علمك تدخين السجائر / السيجار أو الشيشة؟

□ أصدقائك
□ عائلتك
□ تخزين القات
□ جواب أخر _____

10) بعد الانتهاء من تخزينك للقات، هل تستمر بتدخين السجائر / السيجار أو الشيشة؟

□ نعم
□ لا
□ بدون جواب

11) هل حاولت الإقلاع عن تدخين السجائر / السيجار أو الشيشة عندما تخزن القات ؟

□ نعم (كم مرة حاولت _____)
□ لا
□ بدون جواب

12) هل بالإمكان معرفة لماذا تدخن السجائر / السيجار أو الشيشة عندما تخزن القات؟

_____

_____

(قبل انهاء المقابلة يرجئ الذهاب الى قسم 6.3)

قسم 6.3. <u>جمع اللعاب و قياس أول أكسيد الكربون</u>

هَل بإمكانك أعطاء عينةَ من لعابك ...؟

□ نعم عينة رقم : _____
□ لا

هل بالإمكان أن تنفخ داخل هذا الجهاز ...؟

□ نعم قياس**CO** : _____
□ لا

شكراً على تعاونكم

Appendix 6E: Research participant information sheet

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7065
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughese@qmul.ac.uk

Invitation and Information Sheet for Potential Volunteer

1. Study title: Correlates of Khat Chewing (Takzeen) in the Yemeni Community

2. Invitation:

We are inviting you to take part in a research study, which we think may be important. It is important for you to understand why the research is being done and what it will involve. Please take some time to read the following information carefully before deciding to participate in the study. You can discuss with others, ask us if there is something not clear or if you want more information from the persons listed below. Thank you for reading this.

3. What is the purpose of the study?

Khat chewing (Takzeen) is common among the Yemeni community and others from the horn of Africa. It is used mainly as a social lubricant. It is associated with soft drinks intake and heavy smoking. Khat dependency remains a matter of debate. Therefore, this study will assess aspects of khat chewing (Takzeen) and its relationship to cigarette smoking. The study will involve two interviews and the collection of a small sample of saliva. First, an initial recruitment interview of 5 minutes for each potential volunteer will be carried out in place of khat sellers. This will be in order to select the potential volunteer, who meets the criteria of the study. A second arranged interview of 30 minutes for potential volunteers selected by chance will follow. If you decide to participate, we will arrange for you an appropriate time for an interview. During this second interview you will also be invited to provide voluntarily a small sample of saliva.

4. Why have I been chosen?

Because you are currently a male khat chewer from Yemen, permanently resident in -Sheffield UK and your age is over 18 years.

5. Do I have to take part?

It is entirely up to you to decide. If you decide to take part, you will be given this information sheet to keep and asked to sign a consent form. If you decide to take part, you are still free to withdraw at any time and without giving a reason. A decision to withdraw at any time, or a decision not to take part, will not affect you in any way.

6. What will happen to me if I take part?

The study will involve two interviews and the collection of a small sample of saliva. First, an initial recruitment interview of 5 minutes for each potential volunteer will be carried out. This will be in order to select who meets the criteria for the study. A second arranged interview of 30 minutes for volunteers selected by chance will follow. If you decide to participate, we will arrange for you an appropriate time for an interview. In this second interview, you will be asked to voluntarily provide a small sample of saliva.

7. What are the possible disadvantages and risks of taking part?

None, because there will be two interviews and the voluntary collection of a small sample of saliva.

8. What are the possible benefits of taking part?

You will be given information about aspects of khat chewing and tobacco use. This information will enable us to identify whether khat creates dependency or not. In addition, whether there is a relationship between khat and nicotine dependency and this relationship is/not positively /negatively linked.

9. What if new information becomes available?

There is no involvement of any drugs for intervention. The study involves two interviews only and voluntarily collection of a small sample of saliva.

10. What if something goes wrong?

We believe that this study is safe and we do not expect you to suffer any harm because of taking part. However, Barts and The London NHS Trust has agreed that if your health does suffer as a result of taking part in the study then you will be compensated. In such situation, you will not have to prove that the harm or injury, which affects you, is anyone's fault. If you are not happy with any proposed compensation, you may have to pursue claim through legal action.

11. Will my taking part in this study be kept confidential

Information taken from volunteers during the research study will be strictly confidential. All the personal details of the volunteers will be assigned a code number and locked safely in a secure locker. Any information about you which leaves the hospital /surgery will not contain your name and address so that you cannot be identified from it.

12. What will happen to the results of the research study?

Personal details of volunteers will not be identified in any publication or report. All volunteers will be offered feedback through presentations in the community setting in addition to receiving a summary written report. This will be sent to your address on your request. If you want to know more about the study, you can contact the persons listed below. The results will be also published in peer reviewed scientific journals.

13. Who is organising and funding the research?

It is self-financed.

14. Who has reviewed the study?

East London and the City Health Authority Local Research Ethic Committee.

15. Contacts for Further Information

Professor Ray Croucher or Dr Saba Salam
Telephone: 020 73777632 or 07866103642. Fax 020 73777064
Department of Dental Public Health
Institute of Dentistry, Barts and The London
Queen Mary's School of Medicine and Dentistry -University of London.

Appendix 6F: Research participant information sheet (Arabic)

Barts and The London
Turner Street, London E1 2AD
Centre for Adult Oral Health
Professor Francis J Hughes
BDS FDSRCS (Eng) PhD
Telephone: 020 7377 7065
Fax: 020 7377 7064
Website: www.mds.qmul.ac.uk/dental
Email: f.j.hughese@qmul.ac.uk

إستمارة دعوة ومعلومات للمشاركين المتطوعين

1. **عنوان الدراسة : تخزين القات وملازماته بين أبناء الجالية اليمنية**
2. **دعوه :**

ندعوكم للمشاركة في في هذه الدراسة العلمية والتي نعتقد أنها هامة جداً.
من المهم معرفتكم أهداف ومضمون هذه الدراسة العلمية، لذا ندعوكم لقراءة مايلي بتمعن قبل ان تقرر المشاركة في هذه الدراسة. بأمكانكم مناقشة و تدارس موضوع الدراسة مع الأخرين. أذا كان لديكم أي سؤال او استفسارحول هذه الدراسة العلمية او للحصول على معلومات إضافية يُرجى التواصل مع الباحثين المذكوره اسمائهم ادناه.

3. **ماهي أهداف هذه الدراسة ؟**

إن عادة تخزين القات منتشرة في اوساط ابناء الجالية اليمنيية بالمملكة المتحدة والجاليات الأخرى من القرن الافريقي. إن القات يستخدم كنوع من التواصل الأجتماعي. يصاحب تخزين القات تناول المشروبات الغازية و إرتفاع في معدل تدخين السجائر. إن اعتبار تخزين القات إدمان مازال موضع جدل و نقاش. لذلك سوف يتطرق هذا البحث إلى الجوانب المختلفة لظاهره تخزين القات وعلاقته بتدخين السجائر وغيرها.

4. **ماهي شروط إختيار المشارك المتطوع في هذه الدراسة ؟**

الدراسة تشمل أبناء الجالية اليمنية من الرجال المقيميين في المملكة المتحدة والذين يتجاوز أعمارهم 18 سنه و يخزنون القات.

5. **هل يتحتم المشاركه في هذه الدراسة ؟**

المشاركه طوعيه وسيوقع المشارك المتطوع على إستمارة موافقه الأشتراك في هذه الدراسة، وسيقوم الباحثين بتوزيع هذه الأستمارة **"إستمارة دعوة ومعلومات للمشاركين المتطوعين"** على المشاركين المتطوعين.
بإمكان المشارك المتطوع أن ينسحب من الدراسة في أي وقت يشاء و بدون أعطاء الأسباب. إن انسحاب المشارك المتطوع أوعدم مشاركته في الدراسة لن يؤثر عليه.

6. **كيف ستتم الدراسة ؟**

الدراسة تشمل على مقابلتين :
المقابله الأولى : لمدة 5 دقائق يتم فيها أختيار المشارك المتطوع الذي تنطبق عليه شروط المشاركة.
المقابله الثانية : لمدة 30 دقيقه سوف يتم مقابلة المشارك المتطوع الذي تنطبيق علية شروط المقابلة والذي تم اختياره عشوائياً.

7. ما هي الاضرار والمخاطرالتي قد تترتب على المشارك المتطوع في هذه الدراسة ؟

لا توجد مطلقاً اي اضرار او مخاطر. هذه الدراسة تشتمل على اجراء مقابلتين فقط.

8. ماهي الفوائد العائده على كل من المشارك المتطوع و الباحث في المشاركه في هذه الدراسة ؟

المشارك المتطوع سيحصل على معلومات حول الجوانب المختلفه لتخزين القات و التدخين. بالاضافه الى إن هذه المعلومات ستمكن الباحثين من معرفة الإجابه العلميه على ما إذا كان القات يؤدي الى الأدمان أم لا؟ وهل هناك إرتباط بين إدمان القات والسجائر؟ و اخيراً ان كان هنُاك ارتباط ، هل هذا الارتباط سلبي أم إيجابي؟.

9. ماذا في حاله ظهور معلومات أثناء الدراسة ؟

الدراسة لن تشمل على معالجة أو تجربة علاج فبالتالي لن تكون هناك معلومات حول أعراض جانبيه ناتجه عن استخدام أي علاج، لان هذه الدراسة عبارة عن اجراء مقابلتين فقط.

10. ماهي الأجراءت التي يجب إتباعها في حالة حصول ضرر للمشارك المتطوع ؟

نؤمن أن الدراسة مأمونه لا نتوقع ان تسبب الأذى في حالة المشاركة ، حيث وان هذه الدراسة عبارة عن اجراء مقابلتين فقط. هيئه الصحه العامه بلندن (NHS) وافقت على اهداف هذه الدراسة، وفي حاله أن تضررت صحة المشارك المتطوع فيصبح من حقه الحصول على التعويض المناسب. في هذه الحاله لا يمكن تحميل الاضرار التي تؤثر على صحة المتطوع على أنه غلطة أحد. وفي حاله عدم موافقتك على التعويض المقترح بألامكان اتباع الأجراءات القانونيه للتعويض.

11. هل المشاركه في الدراسة سوف تتم بالطريقه السرية ؟

نعم. كل المعلومات التي سيتم جمعها أثناء الدراسة عن المشارك المتطوع ستكون موضع سرية تامة. حيث أن كل مشارك سيعطى له رقماً سرياً عوضاً عن معلوماته الشخصية. هذه المعلومات ستُحفظ في خزانةً محكمة القفل، ولذلك في حالة وصول هذه المعلومات إلى المستشفى أوالعيادة فأن هذه المعلومات لن تحمل اسم المشارك المتطوع بل سيرمز له برقم سري لا يكشف هوية المشارك المتطوع.

12. ماذا سيحصل لنتائج هذه الدراسة ؟

ستعرض نتائج هذه الدراسة على المشاركين المتطوعين في مقر الجالية اليمنية، بالإضافة إلى إعطاء جميع المشاركين المتطوعين نسخة ملخصة من نتائج الدراسة. و بأمكان المشاركين المتطوعين الحصول على نتائج هذه الدراسة بريدياً اذا طلبوا ذلك. وللحصول على معلومات اضافية يرجى الاتصال بالقائمين على هذه الدراسة المذكورين ادناه. هذه الدراسة سيتم نشرها في إحدا المجلات العلمية المحكمة. وللعلم لن تذكر اي معلومة شخصية عن المشاركين المتطوعين في اي تقريراومقالة علمية.

13. ما هي الجهات الممولة لهذه الدراسة ؟

هذه الدراسة تمويل ذاتي للباحثة، حيث أن الدراسة تندرج في اطار مشروع دراستها لنيل درجة الدكتوراه.

14. ما هي الجهه المشرفة على هذه الدراسة ؟

هذه الدراسة تحت إشراف:

East London and City Health Authority Local Research Ethics Committee.

15. للحصول على مزيد من المعلومات يرجى الاتصال على:

Professor Ray Croucher or Dr. Saba Salam
Telephone: 020 73777632 or 07866103642.
Fax 020 73777064
Department of Dental Public Health
Institute of Dentistry, Barts and The London
Queen Mary's School of Medicine and Dentistry-University of London

Appendix 7: Visits to khat sellers, random methodology

Table 1: Outlets, times and days of selling khat

Days of opening	Sellers	1-4 pm	After 4 pm
Saturday	Mr. A Mr. S Mr.G	1 15 17	2 16 18
Sunday	Mr.Y Mr. F	3 19	4 20
Monday	Mr.Y Mr.S	5 21	6 22
Tuesday	Mr. A Mr.Y Mr. S	7 23 25	8 24 26
Wednesday	Mr.Y Mr. S	9 27	10 28
Thursday	Mr.G Mr. S Mr.Y	11 29 31	12 30 32
Friday	Mr. F Mr. G	13 33	14 34

Table 2: Random time table of khat sellers visits

Days	Sellers	Visits slot
Saturday	Mr. S	1-4 pm
Sunday	Mr.Y Mr. F	1-4 pm After 4 pm
Monday	Mr.Y	1-4 pm After 4 pm
Tuesday	Mr.Y Mr. A	1-4 pm After 4
Wednesday	Mr. Y Mr.S	1-4 pm After 4pm
Thursday	Mr.G	1-4 pm After 4pm
Friday	Mr. F	1-4 pm

Appendix 8: Study poster

هل أنت يمني وتخزن القات وعمرك أكثر من 18 سنة ؟
Are you a Yemeni male Khat chewer age 18^{+} years?

هل بإمكانك المساعدة في هذا البحث
تخزين القات وملازماتة؟

سرية المشاركة مضمونة

الرجاء الاتصال بالدكتورة: سبأ سلام

☎: 07866103642 or 02073777632

جامعة كوين ميري- لندن

Can you help in this research on Correlates of khat chewing?

Confidentiality guaranteed

Please contact Dr: **Saba Salam**

☎: **07866103642 or 02073777632**

Barts and The London
Queen Mary's School of Medicine and Dentistry

Appendix 9A: khat chewing behaviours and composite khat behaviour index

Table 1: Items of khat chewing behaviours, categories and scores

Kat chewing behaviours	Scores
Social setting of khat chewing	
With others	0
By yourself	1
Number of days chewing	
2 days or less	0
3 days or more	1
Time starting chewing	
Between 3 and onward	0
Between 1.00-3.00 pm	1
Current khat chewed in a session	
Up to 1 bundles	0
1.25 bundle and more	1
12 prior months khat amount chewed	
Up to 1 bundle	0
1.5 bundle to above	1
Chew more during first hours	
No	0
Yes	1
Khat chewing session	
Up to six hours	0
More than 6 hours	1
Swallow khat juice	
No	0
Yes	1
Chew even ill	
No	0
Yes	1
Whole week not chewing	
Very easy or fairly easy	0
Fairly difficult or very difficult	1
Composite khat behaviour	
Low	≤ 5 scores
High	≥ 6 scores

Appendix 9B: Method of saliva sample collection and analysis

Khat chewers provided saliva by chewing and keeping a cotton-wool dental roll in the mouth until saturated. Gas chromatography analysis for salivary concentration of cathinone was employed: tubes of saliva sample were centrifuged for 30 minutes at 3000 rpm and extracted as follows: calibrators and controls prepared in 0.1% formic acid. Internal standard solution: 2.5µg/mL norephedrin-D3 in 0.1% formic acid 10µL sample / std / QC 100µL internal standard solution 1mL methanol 1mL 0.1% formic acid.Mix and transfer an aliquot to a 96 well plate.Inject 10µL onto the hplc-ms-ms. HPLC:10cm x 4.6mm ID, 5µm Supelcosil LC-SI column held at 50ºC Mobile phase: 75% methanol / 25% 10mMol/L ammonium acetate pumped at 1mL/min.

Appendix 10A: Further data analyses for socio-cultural variables

Table A.1: Source of income amongst unemployed chewers in a sample of UK resident adult male Yemeni khat chewers (132)

Source of income	N	(%)
Looking for job (Job seekers allowance)	43	(32.6)
Out of work (sickness/disability allowance)	27	(20.5)
Retired from work (retirement salary)	56	(42.4)
Full/part time student	6	(4.5)
Total	**132**	**100.0**

Table A.2: Number of visits per month by family, in the last 12 months, of a sample of UK resident adult male Yemeni khat chewers (n=119)

Number of visits by family	N	(%)
Not at all	8	(6.7)
Once or twice	31	(26.1)
Three to six times	27	(22.7)
Above six times	53	(44.5)
Total	**119**	**100.0**

Table A.3: Number of times talk to family on phone per month, in the last 12 months, of a sample of UK resident adult male Yemeni khat chewers (n=119)

Number of times talk to family	N	(%)
Not at all	5	(4.2)
Once or twice	26	(21.8)
Three to six times	34	(28.6)
Above six times	54	(45.4)
Total	**119**	**100.0**

Table A.4: Number of visits by Yemeni friend, per month, in the last 12 months of a sample of UK resident adult male Yemeni khat chewers (n=198)

Number of visits by Yemeni friend	N	(%)
Not at all	68	(34.3)
Once or twice	64	(32.3)
Three to six times	41	(20.7)
Above six times	25	(12.6)
Total	**198**	**100.0**

Table A.5: Number of visits by Yemeni neighbour, per month, in the last 12 months of a sample of UK resident adult male Yemeni khat chewers (152)

Number of visits by Yemeni neighbour	N	(%)
Not at all	32	(21.1)
Once or twice	46	(30.3)
Three to six times	44	(28.9)
Above six times	30	(19.7)
Total	**152**	**100.0**

Table A.6: Number of times participating in Yemeni activities, monthly, apart from khat chewing in the last 12 months of a sample of UK resident adult male Yemeni khat chewers (n=204)

Number of times participating in Yemeni activities	N	(%)
Not at all	123	(60.3)
Once or twice	67	(32.8)
Three to six times	9	(4.4)
Above six times	5	(2.5)
Total	**204**	**100.0**

Table A.7: Number of times participated in activities such as playing sport, per month, in the last 12 months in a sample of UK resident adult male Yemeni khat chewers (n=201)

Number of times participating in sport activities	N	(%)
Not at all	128	(63.7)
Once or twice	22	(10.9)
Three to six times	28	(13.9)
Above six times	23	(11.4)
Total	**201**	**100.0**

Table A.8: Mean number of self reporting health conditions in a sample of UK resident adult male Yemeni khat chewers (n=77)

Number of Observation	Mean	Minimum	Maximum	Std. Dev	95%CI
77	1.6104	1.00	5.00	±0.92	(1.4016-1.8192)

Table A.9: Number of self-reported health conditions of a sample of UK resident adult male Yemeni khat chewers (n=77)

Number of self-reported health conditions	N	(%)
With 1 health condition	45	(58.4)
With 2 or more health conditions	32	(41.6)
Total	**77**	**100.0**

Table A10: Mean number of self reported health conditions by age group of a sample of UK resident adult male Yemeni khat chewers (n=77)

Age	Number of Observation	Mean no health condition	Std.Dev	95%CI
From18-29 years	7	1.1429	0.37	(0.7933-1.4924)
From30-40 years	9	1.1111	0.33	(0.8549-1.3673)
From 41-64 years	23	1.4783	0.95	(1.0687-1.8879)
65 years and older	38	1.8947	0.98	(1.5724-2.2171)

Table A.11: Mean number of self reported health conditions by self rated health of a sample of UK resident adult male Yemeni khat chewers (n=77)

Self rated health	Number of Observation	Mean no health condition	Std.Dev	95%CI
Uncompromised	14	1.29	0.47	(1.02-1.56)
Compromised	63	1.68	1.00	(1.44-1.93)

Table A.12: Self reported psychological health conditions of a sample of UK resident adult male Yemeni khat chewers (n=77)

Self reported psychological health conditions	N	(%)
Yes	13	(16.9)
No	64	(83.1)
Total	**77**	**100.0**

Table A.13: Self reported arthritis condition in a sample of UK resident adult male Yemeni khat chewers (n=77)

Self reported arthritis	N	(%)
Yes	18	(23.4)
No	59	(76.6)
Total	**77**	**100.0**

Table A.14: Self reported other medical conditions in a sample of UK resident adult male Yemeni khat chewers (n=77)

Self reported other health conditions	N	(%)
Yes	21	(27.3)
No	56	(72.7)
Total	**77**	**100.0**

Table A.15: Number of self reported oral problems of a sample of UK resident adult male Yemeni khat chewers (n=60)

Number of self reported oral l problems	N	(%)
One oral problem	23	(38.3)
Two oral problem	37	(61.7)
Total	**60**	**100.0**

Table A.16: Age by self rated health of a sample of UK resident adult male Yemeni khat chewers (n=204)

Self rated health	Number of Observation	Mean age	Std.Dev	95%CI
Uncompromised	122	36.59	15.98	(33.73-39.45)
Compromised	82	57.11	18.32	(53.08-61.14)

Appendix 10B: Further data analyses for tobacco use variables

Table B.1: Place of starting tobacco smoking amongst regular cigarette smokers respondents (RSR) in a sample of UK resident adult male Yemeni khat chewers (n=91)

Place of starting tobacco smoking amongst RSR	N	(%)
Yemen	60	(65.9)
UK	24	(26.4)
Other places	7	(7.7)
Total	**91**	**100.0**

TableB.2: Age of starting cigarette smoking amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Age of starting cigarette smoking amongst RSR	N	(%)
10-15 years	24	(26.4)
16-19 years	35	(38.5)
20 years and older	32	(35.2)
Total	**91**	**100.0**

Table B.3: Past used of other tobacco products amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Past used for other tobacco products amongst RSR	N	(%)
Cigarette	70	(76.9)
Shisha	5	(5.5)
Cigarette and Shisha	10	(11.0)
Other tobacco products e.g. Shamma	1	(1.1)
Traditional shisha (mada'a)	2	(2.2)
Non of the above	3	(3.3)
Total	**91**	**100.0**

Table B.4: Past used of other tobacco products amongst ESR in a sample of UK resident adult male Yemeni khat chewers (n=42)

Past used of other tobacco products amongst ESR	N	(%)
Cigarettes	12	(28.6)
Shisha	14	(33.3)
Cigarettes and shisha	3	(7.1)
Smokless tobacco (Shamma)	2	(4.8)
Other (none of the above)	11	(26.2)
Total	**42**	**100.0**

Table B.5: Close friend smoking amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Close friend smoking amongst RSR	N	(%)
Yes	85	(93.4)
No	6	(6.6)
Total	**91**	**100.0**

Table B.6: Partner's or wife's smoking cigarettes amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Partner's or /wife's smoking amongst RSR	N	(%)
Yes	27	(29.7)
No	64	(70.3)
Total	**91**	**100.0**

Table B.7: Father's cigarettes smoking amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Father's cigarettes smoking amongst RSR	N	(%)
Yes	58	(63.7)
No	33	(36.3)
Total	**91**	**100.0**

Table B.8: Mother's cigarettes smoking amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Mother's cigarettes smoking amongst RSR	N	(%)
Yes	9	(9.9)
No	82	(90.1)
Total	**91**	**100.0**

Table B.9: Father's used of other tobacco products amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Father's used of other tobacco products amongst RSR	N	(%)
Yes	8	(8.8)
No	83	(91.2)
Total	**91**	**100.0**

Table B.10: Mother's used of other tobacco products amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Mother's used of other tobacco products amongst RSR	N	(%)
Yes	10	(11.0)
No	81	(79.1)
Total	**91**	**100.0**

Table B.11: Father's types of tobacco products used amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=90)

Father's types of tobacco products used amongst RSR	N	(%)
Shisha	1	(1.1)
Traditional shisha	7	(7.8)
Cigarette smoker	58	(64.4)
Non tobacco user	24	(26.7)
Total	**90**	**100.0**

Table B.12: Mother's types of tobacco products used amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Mother's types of tobacco products used amongst RSR	N	(%)
Shisha	2	(2.2)
Traditinal shisha	8	(8.8)
Cigarettes smoker	9	(9.9)
Non tobacco user	72	(79.1)
Total	**91**	**100.0**

Table B.13: Level of cigarettes smoking during khat chewing amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Level of cigarettes smoking during khat chewing amongst RSR	N	(%)
Much more likely to smoke cigarettes	76	(83.5)
More likely to smoke cigarettes	2	(2.2)
likely to smoke cigarettes just the same	9	(9.9)
Less likely to smoke cigarettes	3	(3.3)
Much less likely to smoke cigarettes	1	(1.1)
Total	**91**	**100.0**

Table B.14: Scores categories of CO amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Scores categories of CO amongst RSR	N	(%)
0-5 score	8	(8.8)
6-10 score	10	(11.0)
11-20 score	37	(40.7)
21-39 score	31	(34.1)
40 score and more	5	(5.5)
Total	**91**	**100.0**

Table B.15: Scores categories of CO amongst ESR in a sample of UK resident adult male Yemeni khat chewers (n=39)

Scores categories of CO amongst ESR	N	(%)
0-5 score	15	(38.5)
6-10 score	4	(10.3)
11-20 score	7	(17.9)
21-39 score	9	(23.1)
40 score and more	4	(10.3)
Total	39	**100.0**

Table B.16: Number of records of (CO) during different times of the day amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=91)

Measures of CO during different times of the day amongst RSR	N	(%)
During khat chewing	47	(51.6)
Other times	44	(48.4)
Total	91	**100.0**

Table B.17: Number of records of (CO) during different times of the day amongst ESR in a sample of UK resident adult male Yemeni khat chewers (n=39)

Measures of CO during different times of the day amongst ESR	N	(%)
During khat chewing	21	(58.0)
Other times	15	(42.0)
Total	36	**100.0**

Table B.18: Difficult /or ease to go without smoking cigarette a whole day amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=90)

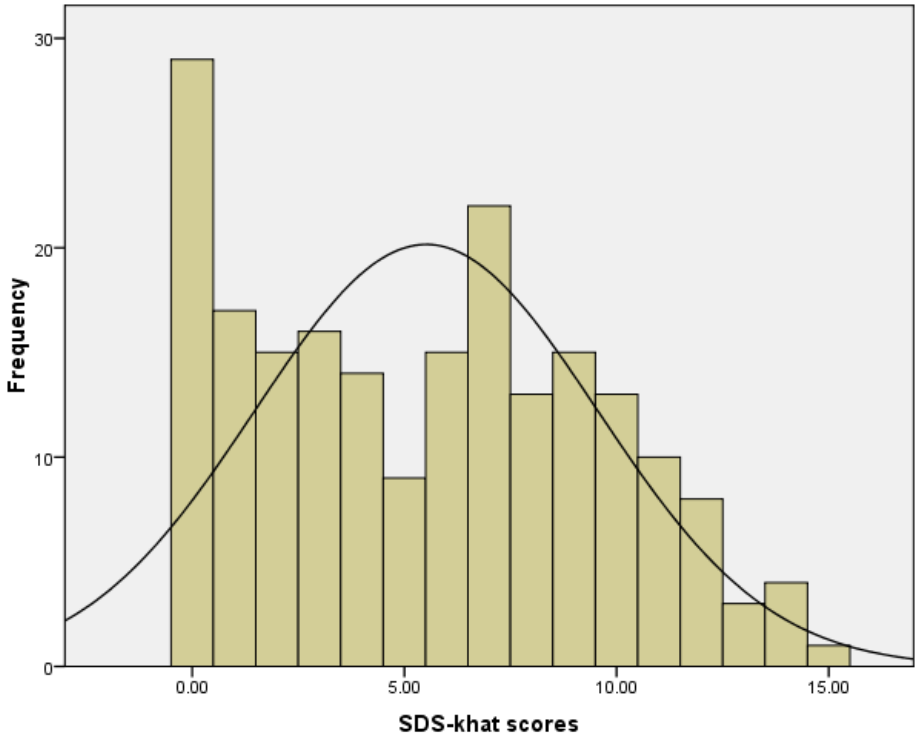
Difficult /or ease to go without smoking cigarette a whole day amongst RSR	N	(%)
Very easy	4	(4.4)
Fairly easy	20	(22.2)
Fairly difficult	42	(46.7)
Very difficult	24	(26.7)
Total	**90**	**100.0**

Table B.19: Desire to give up cigarettes smoking amongst RSR in a sample of UK resident adult male Yemeni khat chewers (n=76)

Desire to give up cigarettes smoking amongst RSR	N	(%)
Slightly	3	(3.9)
Moderate	14	(18.4)
Quite strongly	33	(43.4)
Very strongly	26	(34.2)
Total	**76**	**100.0**

Appendix 10C: Distribution of SDS-Khat scores

Histogram of the distribution of SDS-Khat scores in a sample of UK resident adult male Yemeni khat chewers (n=204)



Appendix 10D: Health outcomes by khat chewing behaviours

Table.1: Frequency distribution and results of simple logistic regression of self-rated health and khat chewing behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Khat chewing behaviours	Self-rated health					
	Uncompromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	P-value
Social setting of khat chewing						
With others	114	(65.1)	61	(34.9)	1	
Alone (own self)	8	(27.6)	21	(72.4)	4.91 (2.05-11.73)	0.000
Number of days chewing						
2 days or less	75	(68.8)	34	(31.2)	1	
3 days or more	47	(49.5)	48	(50.5)	2.25 (1.27-3.99)	0.005
Time for chewing						
Between 3 and onward	73	(65.2)	39	(34.8)	1	
Between 1.00-3.00 pm	49	(53.3)	43	(46.7)	1.64 (0.93-2.89)	0.085
Khat chewed in a session						
From lowest to 1 bundles	69	(65.7)	36	(34.3)	1	
1.25 bundle and more	53	(53.5)	46	(46.5)	1.66 (0.95-2.93)	0.077
12 prior months amount chewed						
From lowest to 1 bundle	78	(74.3)	27	(25.7)	1	
From 1.5 bundle to above	44	(44.4)	55	(55.6)	3.61 (2.00-6.52)	0.000
Chew more during first hours						
No	66	(68.0)	31	(32.0)	1	
Yes	56	(52.3)	51	(47.7)	1.94 (1.10-3.43)	0.023
Khat chewing session						
Up to six hours	82	(55.8)	65	(44.2)	1	
More than 6 hours	40	(70.2)	17	(29.8)	0.54 (0.28-1.03)	0.062
Chew even ill						
No	81	(64.8)	44	(35.2)	1	
Yes	41	(51.9)	38	(48.1)	1.71(0.96-3.03)	0.068
Swallow khat juice						
No	14	(53.8)	12	(46.2)	1	
Yes	108	(60.7)	70	(39.3)	0.77 (0.33-1.73)	0.508
Whole week not chewing						
Very easy and fairly easy	83	(69.2)	37	(30.8)	1	
Fairly difficult and very difficult	39	(46.4)	45	(53.6)	2.59 (1.45-4.61)	0.001

Table.2: Frequency distribution and results of simple logistic regression of self reported oral problems and khat chewing behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Khat chewing behaviours	Self reported oral problems					
	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	P-value
Social setting for khat chewing						
With others	127	(72.6)	48	(27.4)	1	
Alone (own self)	17	(58.6)	12	(41.4)	1.87 (0.83-4.20)	0.131
Number of days chewing						
2 days or less	81	(74.3)	28	(25.7)	1	
3 days or more	63	(66.3)	32	(33.7)	1.47 (0.80-2.70)	0.212
Time for chewing						
Between 3 and onward	83	(74.1)	29	(25.9)	1	
Between 1.00-3.00 pm	61	(66.3)	31	(33.7)	1.45 (0.80-2.67)	0.225
Khat amount chewed in session	80	(76.2)	25	(23.8)	1	
From lowest to 1 bundles	64	(64.6)	35	(35.4)	1.75 (0.95-3.22)	0.072
1.25 bundle and more						
12 prior months amount chewed	81	(77.1)	24	(22.9)	1	
From lowest to 1 bundle	63	(63.6)	36	(34.4)	1.93 (1.05-3.56)	0.036
From 1.5 bundle to above						
Chew more during first hours						
No	71	(73.2)	26	(26.8)	1	
Yes	73	(68.2)	34	(31.8)	1.27 (0.69-2.33)	0.437
Khat chewing session						
Up to six hours	100	(68.0)	47	(32.0)	1	
More than 6 hours	44	(72.2)	13	(22.8)	0.63 (0.31-1.28)	0.200
Chew even ill						
No	88	(70.4)	37	(29.6)	1	
Yes	56	(70.9)	23	(29.1)	0.98 (0.53-1.81)	0.941
Swallow khat juice						
No	12	(46.2)	14	(53.8)	1	
Yes	132	(74.2)	46	(25.8)	0.30 (0.13-0.70)	0.005
Whole week not chewing						
Very easy and fairly easy	90	(75.0)	30	(25.0)	1	
Fairly difficult and very difficult	54	(64.3)	30	(35.7)	1.67 (0.91-3.06)	0.100

Table. 3: Frequency distribution and results of simple logistic regression of self reported health conditions and khat chewing behaviours in a sample of UK resident adult male Yemeni khat chewers (n=204)

Khat chewing behaviours	Self reported health conditions					
	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	P-value
Social setting for khat chewing						
With others	116	(66.3)	56	(33.7)	1	
Alone (own self)	11	(37.9)	18	(62.1)	3.22 (1.43-7.25)	0.005
Number of days chewing)						
2 days or less	75	(68.8)	34	(31.2)	1	
3 days or more	52	(54.7)	43	(45.3)	1.82 (1.03-3.23)	0.040
Time starting chewing						
Between 3 and onward	81	(72.3)	31	(27.7)	1	
Between 1.00-3.00 pm	46	(50.0)	46	(50.0)	2.61(1.46-4.68)	0.001
Khat amount chewed in session						
From lowest to 1 bundles	74	(70.4)	31	(29.5)	1	
1.25 bundle and more	53	(53.5)	46	(46.5)	2.07 (1.17-3.69)	0.013
12 prior months amount chewed						
From lowest to 1 bundle	84	(80.0)	21	(20.0)	1	
From 1.5 bundle to above	43	(43.4)	56	(56.6)	5.21(2.80-9.70)	0.001
Chew more during first hours						
No	67	(69.1)	30	(30.9)	1	
Yes	60	(56.1)	47	(43.9)	1.75 (0.98-3.11)	0.057
Khat chewing session						
Up to six hours	87	(59.2)	60	(40.8)	1	
More than 6 hours	40	(70.2)	70	(29.8)	0.62 (0.32-1.89)	0.148
Swallow khat juice						
No	15	(57.7)	11	(42.3)	1	
Yes	112	(62.9)	66	(37.1)	0.80 (0.35-1.85)	0.608
Chew even ill						
No	81	(64.8)	44	(35.2)	1	
Yes	46	(58.2)	33	(41.8)	1.32 (0.74-2.36)	0.346
Whole week not chewing						
Very easy or fairly easy	83	(69.2)	37	(30.8)	1	
Fairly difficult or very difficult	44	(52.4)	40	(47.6)	2.04 (1.15-3.64)	0.016

Table. 4: Frequency distribution and results of simple logistic regression of self reported 'high' nicotine dependence and khat chewing behaviours in a sample of UK resident adult male Yemeni khat chewers (n=91)

Khat chewing behaviours	Self reported 'high' nicotine dependence					
	Low N (%)		High N (%)		Unadjusted OR (95%CI)	P-value
Number of days chewing)						
2 days or less	33	(76.7)	10	(23.3)	1	
3 days or more	18	(37.5)	30	(62.5)	5.50 (2.20-13.77)	0.001
Time starting chewing						
Between 3 and onward	31	(57.4)	23	(42.6)	1	
Between 1.00-3.00 pm	20	(54.1)	17	(45.9)	1.15 (0.49-2.66)	0.752
Khat amount chewed in session						
From lowest to 1 bundles	31	(66.0)	16	(34.0)	1	
1.25 bundle and more	20	(45.5)	24	(54.5)	2.33 (1.00-5.42)	0.049
12 prior months amount chewed						
From lowest to 1 bundle	32	(61.5)	20	(38.5)	1	
From 1.5 bundle to above	19	(48.7)	20	(51.3)	1.68 (0.73-3.90)	0.223
Chew more during first hours						
No	27	(60.0)	18	(40.0)	1	
Yes	24	(52.2)	22	(47.8)	1.38 (0.60-3.16)	0.452
Khat chewing session						
Up to six hours	36	(58.1)	26	(41.9)	1	
More than 6 hours	15	(51.7)	14	(48.3)	1.29 (0.53-3.13)	0.570
Chew even ill						
No	37	(74.0)	13	(26.0)	1	
Yes	14	(34.1)	27	(65.9)	5.49 (2.22-13.56)	0.001
Whole week not chewing						
Very easy or fairly easy	37	(69.8)	16	(30.2)	1	
Fairly difficult or very difficult	14	(36.8)	24	(63.2)	3.96 (1.64-9.58)	0.002

Appendix 10E: Tests of covariance between correlates of health outcomes

Table 1: Testing covariance between correlates of self-rated health and self reported health conditions (n=204)

Variables	Social Participation				Unadjusted OR (95%CI)	P-Value
	High N (%)		Low N (%)			
Employment status						
Employed	45	(62.5)	27	(37.5)	1	
Unemployed	54	(40.9)	78	(59.1)	2.41 (1.33-4.34)	0.003
Crowding index						
Crowded	48	(57.8)	35	(42.2)	1	
Uncrowded	50	(41.7)	70	(58.3)	1.92 (1.08-3.38)	0.023
	Crowding index					
	Crowded		**Uncrowded**			
Employment status	**N (%)**		**N (%)**			
Employed	41	(49.4)	42	(50.6)	1	
Unemployed	31	(25.8)	89	(74.2)	2.8 (1.55 -5.07)	0.001

Table 2: Testing covariance between correlates of self reported 'high' dependence (n=91)

Variables	Place starting smoking				Unadjusted OR (95%CI	P-Value
	Yemen N (%)		UK and elsewhere N (%)			
Marital status						
Married	45	(72.6)	17	(27.4)	1	
Other marital status	15	(51.7)	14	(48.3)	2.47 (0.99-6.18)	0.050
Social participation						
High	24	(54.5)	20	(45.5)	1	
Low	36	(76.6)	11	(23.4)	0.38 (0.15-0.91)	0.027
	Social participation					
	High		**Low**			
Marital Status	**N (%)**		**N (%)**			
Married	29	(46.8)	33	(53.2)	1	
Other status	15	(51.7)	14	(48.3)	0.820 (0.34-1.98)	0.830

Appendix 10F: Background of health outcomes models development

1. Self rated 'compromised' health

The hierarchical logistic regression analysis of self-rated 'compromised' health with selected explanatory variables was performed in three stages (Table 1).

Stage I (a & b) included the distal variables, namely, the demographic and socio-cultural variables. In Stage I (a) the first variables entered into the model were employment status, education level, crowding index, marital status, family size, living with chewer and age. The latter was entered into the model because the relationship of age with health outcomes amongst khat chewers is sparse in the literature. In the univariate analysis, older respondents were 9.13 (95%CI=4.71-17.68) times more likely to self-rate health 'compromised'. After adjusting for employment status, education level, crowding index, marital status, family size, and living with chewer age remained significantly associated with self-rated 'compromised' health (p=0.001) though its effect reduced (OR=5.01, 95%CI =1.80-13.98). Low level of completed education was significantly associated with self-rated 'compromised' health in the univariate analysis, but lost significance after adjusting for age, employment, crowding index, marital status, family size and living with chewer. Unemployment at this Stage I (a), in the presence of level of completed education, age and other variables mentioned earlier, became attenuated (p ≤0.001, OR=6.19, 95%CI =2.31-16.56). A slight decrease in the effect of living in an uncrowded housing was also observed (p ≤0.001, OR=3.70, 95%CI = 1.67-8.21).

Stage I (b) in Table 1 included the following variables: UK residency, language preferred for reading and place where respondents started khat chewing. These variables were assessed in the presence of Stage I (a) variables (age, level of education, employment status crowding variable, marital status, family size and living with chewer). None of the acculturation variables associated with self-rated 'compromised' health in simple logistic regression remained significantly associated with self-rated 'compromised' health (p=0.137, p=0.992, p=0.613 respectively). The effects of unemployment on the likelihood of respondents' self-rating 'compromised' health increased slightly (OR=7.15, 95%CI= 2.45-20.85). Level of completed education remained insignificant (p=0.373) and a further reduction in the effect of age was observed.

Stage II (Table 1) assesses the psychosocial variables (social participation and severity of dependence on khat (SDS-khat) and their effect on the likelihood of self-rated 'compromised' health in the presence of Stage I (a & b) variables. When psychosocial variables were entered into the model, a slight decrease in the effects of social participation (from that in the univariate analysis) and the effect of unemployment from previous model was observed. The odds ratios changes for both social participation and unemployment were 3.52 (95%CI=1.94-6.37) to 2.76 (95%CI=1.30-5.89) and from 7.15 (95%CI=2.45-20.85) to 5.56 (95%CI=1.91-16.20), respectively (Table1). Other variables in the model, including level of completed education, SDS-khat, place of starting chewing, period of residency in the UK, living with other chewer, marital status and language preferred for reading, did not remain statistically significantly associated with self-rated 'compromised' health (Table 1).

Finally, in Stage III, when the composite index of khat chewing behaviour was entered into the model after adjusting for other variables from earlier stages, the effects of age, employment status, crowding index and social participation remained significant. This final model yielded from Stage III is presented in Chapter 4 Table 4.13, Page152.

Further exploratory modelling was undertaken as follows:

- Omitting the SDS did not reveal any variance from the above model. Age, employment status, crowding index and social participation remained the only variables significantly associated with self-rated 'compromised' health (Table not shown). Adding tobacco smoking behaviour in this model with the composite index of khat chewing behaviour made a poor contribution in the model's goodness of fit (Table not shown). The model displayed a chi- square at 99.72, df=11, $p<0.001$ and a Hosmer-Lemeshow Goodness of fit at 16.97 and df= 8, $p=0.030$.

- Omitting the composite index of khat chewing behaviour as well did not reveal any variance from the final adjusted model (Chapter 4, Table 4.13). Age, employment status, crowding index and social participation remained significantly associated with self-rated 'compromised' health (Table not shown). Adding tobacco smoking behaviour in this model made a poor contribution in the model's goodness of fit.

Table1: Relationships between self-rated 'compromised' health and demographic, socio-cultural, psychosocial and behavioural explanatory variables in a hierarchical regression model (n=204)

Explanatory variables	Un-compromised N (%)		Compromised N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI) Stage I (a)	Adjusted OR (95%CI) Stage I (b)	Adjusted OR (95%CI) Stage II
Demographic and socio-cultural distal explanatory variables								
Age								
18-40 years	86	(83.5)	17	(16.5)	1	1	1	1
41 years and older	36	(35.6)	65	(64.4	9.13 (4.71-17.68)***	5.01 (1.80-13.98) ***	4.24 (1.43-12.60) ***	4.43 (1.45-13.52) ***
Employment								
Employed	65	(90.3)	7	(9.7)	1	1	1	1
Unemployed	57	(43.2)	75	(56.8)	12.22 (5.21-28.65) ***	6.19 (2.31-16.56) ***	7.15 (2.45-20.85) ***	5.56 (1.91-16.20) ***
Education Level								
High education	54	(77.1)	16	(22.9)	1		1	1
Low education	68	(50.7)	66	(49.3)	3.28 (1.71-6.29) ***	1.72 (0.75-3.91)	1.49 (0.62-3.59)	1.26 (0.51-3.11)
Crowding index ^								
Overcrowded	67	(80.7)	16	(19.3)	1	1	1	1
Uncrowded	54	(45.0)	66	(55.0)	5.12 (2.66-9.84)***	3.70 (1.67-8.21) ***	3.16 (1.38-7.22)***	2.76 (1.18-6.42) **
Marital status								
Married	88	(56.4)	68	(43.6)	1	1	1	1
Other marital status	34	(70.8)	14	(29.2)	0.53(0.27-1.07)*	1.10 (0.38-3.18)	1.04 (0.35-3.11)	1.03 (0.33-3.20)
Family size								
Small	82	(70.1)	35	(29.9)	1	1	1	1
Large	40	(46.0)	47	(54.0)	2.75 (1.54-4.91)***	0.58 (0.22-1.53)	0.58 (0.22-1.57)	0.60 (0.22-1.65)
Living with chewer								
No	78	(66.7)	39	(33.3)	1	1	1	1
Yes	44	(50.6)	43	(49.4)	1.96 (1.11-3.46) **	1.36 (0.64-2.89)	1.40 (0.66-3.04)	1.47 (0.66-3.24)
UK Residency								
Long	45	(44.1)	57	(55.9)	1		1	1
Short	77	(75.5)	25	(24.5)	0.26 (0.14-0.47)***		0.54 (0.23-1.22)	0.53 (0.22-1.26)
Reading language								
English, English & Arabic	64	(74.4)	22	(25.6)	1		1	1
Arabic and other	58	(49.2)	60	(50.8)	3.01 (1.65-5.51) ***		1.01 (0.41-2.44)	0.96 (0.39-2.33)
Place started chewing								
UK and elsewhere	32	(74.4)	11	(25.6)	1		1	1
Yemen	90	(55.9)	71	(44.1)	2.30 (1.08-4.87) **		0.76 (0.26-2.24)	0.77 (0.27-2.25)

Table 1: (continued)

Psychosocial intermediate explanatory variables								
Social participation								
High	74	(74.7)	25	(25.3)	1			1
Low	48	(45.7)	57	(54.3)	3.52 (1.94-6.37) ***			2.76 (1.30-5.89)***
Khat dependence								
Non-dependent	74	(74.0)	26	(26.0)	1			1
Dependent	48	(46.2)	56	(53.8)	3.32 (1.84-5.99) ***			1.60 (0.72-3.55)
Proximal behavioural explanatory variables								
Composite khat behaviour								
Low	92	(70.8)	38	(29.2)	1			
High	30	(40.5)	44	(59.5)	3.55 (1.95-6.46)***			

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

2. Self-reported oral problems

To model the relationship between self-reported oral problems and selected explanatory variables entered into the models, the hierarchical multiple model logistic regression analysis was run in three stages (Table 2).

In Stage I (a), age was adjusted for employment status, education level, crowding, family size and maternal khat chewing. The results showed that the effect of level of education was attenuated but remained significantly associated with self-reported oral problems (p=0.019, OR=2.56, 95%CI=1.17-5.61). At this stage, age, employment status, crowding, family size and mother chewing khat variables were not statistically significantly associated with self-reported oral problems. When the place of starting khat chewing was added to the model at Stage I (b) (Table 2) in the presence of variables from Stage 1 (a) age, employment status, crowding variable, family size, maternal khat chewing remained statistically insignificant. Place of starting khat chewing in the presence of these variables also lost its significant association with self-reported oral problems. A further slight decrease in the effect of level of completed education in self-reporting oral problems was observed, though remaining significant (p= 0.020; OR=2.54; 95%CI=1.16-5.57). Preferred reading language was statistically significantly associated with self-reported oral problems. At this stage preferred reading language was left out of the model because of its impact on the effect of level of completed education. However, preferred reading language is reported as a proxy for level of education attained (Woloshin et al., 1997).

Stage II included the psychosocial variables. Social participation and khat dependence were entered into the model alongside the variables from Stage I (a & b). Apart from completed level of education, which remained statistically

significantly (p=0.045) associated with self-reported oral problems, the results of this stage showed that all other entered variables were insignificant.

Pattern of dental attendance was the only proximal behavioural variable associated with self-reported oral problems. Adding dental attendance into the model contributed poorly to the model and was omitted. The composite of khat chewing behaviour was then entered into the model in Stage III in the presence of other variables. Only low level of completed education remained significantly associated with self-reported oral problems. The final model yielded from Stage III is presented in Chapter 4 Table 4.19, Page 159.

Further modelling was undertaken as follows:

- Though tobacco smoking was not significantly associated with self-reported oral problems (at $p \leq 0.1$) in simple logistic regression, the composite index of khat chewing behaviour (Table 3) was entered into the previous model (Chapter 4, Table 4.19) alongside smoking behaviour. The results reported in (Table 3) remained similar to the final model in Chapter 4 Table 4.19. All the variables remained insignificant, and again only low level of completed education remained significantly associated with self-report oral problems (Table 3).
- Adding all the behavioural variables (composite index of chewing, smoking tobacco and dental attendance) to the model in Table 4, resulted in all the variables becoming insignificant, apart from level of completed education which was marginally significant (P=0.055).

- Omitting the SDS-khat from the model and adding the composite index of khat behaviour by itself and then with tobacco and finally with dental attendance did not change the results in the final model Chapter 4. Table 4.19. A low level of completed education only remained significantly associated with self-reported oral problems (Table not shown).

- Omitting composite index of khat behaviour and retaining SDS-khat yielded the same results as Chapter 4. Table 4.19 when tobacco behaviour was added by itself. However, after adding tobacco behaviour alongside the pattern of attendance the effect of low level of completed education in a self-reported oral problems remained but was less significant (p=0.052) (Table not shown).

Table 2: Relationships between self-reported oral problems and demographic, socio-cultural, psychosocial and behavioural explanatory variables in a hierarchical regression model (n=204)

Explanatory variables	No oral problems N (%)		With oral problems N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI) Stage I (a)	Adjusted OR (95%CI) Stage I (b)	Adjusted OR (95%CI) Stage I (a & b), II
Demographic and socio-cultural distal explanatory variables								
Age								
18-40 years	82	(79.6)	21	(20.4)	1	1	1	1
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)***	1.35 (0.57-3.23)	1.32 (0.55-3.16)	1.28 (0.53-3.10)
Employment status								
Employed	60	(83.3)	12	(16.7)	1	1	1	1
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)***	1.85 (0.79-4.33)	1.62 (0.67-3.93)	1.48 (0.61-3.62)
Level of education								
High education	59	(84.3)	11	(15.7)	1	1	1	1
Low education	85	(63.4)	49	(36.6)	3.09 (1.49-6.44)***	2.56 (1.17-5.61) **	2.54 (1.16-5.57) **	2.27 (1.02-5.03) **
Crowding index^								
Overcrowded	64	(77.1)	19	(22.9)	1	1	1	1
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)*	1.26 (0.63-2.52)	1.31 (0.65-2.64)	1.19 (0.58-2.44)
Family size								
0-3 children	89	(76.1)	28	(23.9)	1		1	1
4 children and more	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)**	0.99 (0.45-2.19)	0.95 (0.43-2.11)	0.95 (0.42-2.11)
Mother chewing khat								
No	121	(73.3)	44	(26.7)	1	1	1	1
Yes	23	(59.0)	16	(41.0)	1.91(0.93-3.95)*	1.73 (0.80-3.74)	1.75 (0.81-3.79)	1.64 (0.75-3.61)
Psychosocial intermediate explanatory variables								
Place started chewing								
UK and elsewhere	36	(83.7)	7	(16.3)	1		1	1
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)**		1.68 (0.64-4.43)	1.59 (0.60-4.18)
Social participation								
High	76	(76.8)	23	(23.2)	1			1
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.33)*			1.34 (0.68-2.60)
Khat dependence								
Non-dependent	80	(80.0)	20	(20.0)	1			1
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)***			1.57 (0.78-3.14)
Behavioural proximal explanatory variables								
Composite khat behaviour								
Low	96	(73.8)	34	(26.2)	1			
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.84)			

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

Table 3: Further modelling of self-reported oral problems and proximal behaviours (khat chewing and tobacco smoking)

Explanatory variables	No oral problems N (%)		With Oral problems N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and Socio-cultural distal explanatory variables						
Age						
18-40 years	82	(79.6)	21	(20.4)	1	1
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)***	1.44 (0.59-3.54)
Employment status						
Employed	60	(83.3)	12	(16.7)	1	1
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)***	1.48 (0.60-3.62)
Level of education						
High education	59	(84.3)	11	(15.7)	1	1
Low education	85	(63.4)	49	(36.6)	3.09 (1.49-6.44)***	2.34 (1.05-5.25) **
Crowding index^						
Overcrowded	64	(77.1)	19	(22.9)	1	1
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)*	1.29 (0.62-2.68)
Family size						
0-3 children	89	(76.1)	28	(23.9)	1	1
4 children and more	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)**	1.00 (0.44-2.27)
Mother chewing khat						
No	121	(73.3)	44	(26.7)	1	1
Yes	23	(59.0)	16	(41.0)	1.91 (0.93-3.95)*	1.56 (0.70-3.53)
Place started chewing						
UK and elsewhere	36	(83.7)	7	(16.3)	1	1
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)**	1.55 (0.59-4.11)
Psychosocial intermediate explanatory variables						
Social participation						
High	76	(76.8)	23	(23.2)	1	1
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.33)*	1.40 (0.71-2.76)
Khat dependence						
Non-dependent	80	(80.0)	20	(20.0)	1	1
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)***	1.93 (0 .87-4.27)
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	96	(73.8)	34	(26.2)	1	1
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.84)	0.69 (0.31-1.54)
Tobacco smoking						
Non smoker respondents	51	(71.8)	20	(28.2)	1	1
Episodic smoker respondents	29	(69.0)	13	(31.0)	1.14 (0.50-2.63)	1.75 (0.67-4.60)
Regular smoker respondents	64	(70.3)	27	(29.7)	1.08 (0.54-2.14)	1.48 (0.68-3.21)

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

Table 4: Further modelling of self-reported oral problems and proximal behaviours (khat chewing, tobacco smoking and dental attendance)

Explanatory variables	No oral problems N (%)		With Oral problems N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and Socio-cultural distal explanatory variables						
Age						
18-40 years	82	(79.6)	21	(20.4)	1	1
41 years and older	62	(61.4)	39	(38.6)	2.46 (1.32-4.59)***	1.18 (0.46-3.05)
Employment status						
Employed	60	(83.3)	12	(16.7)	1	1
Unemployed	84	(63.6)	48	(36.4)	2.86 (1.40-5.84)***	1.81 (0.71-4.59)
Level of education						
High education	59	(84.3)	11	(15.7)	1	1
Low education	85	(63.4)	49	(36.6)	3.09(1.49-6.44)***	2.24 (0.98-5.12)*
Crowding index^						
Overcrowded	64	(77.1)	19	(22.9)	1	1
Uncrowded	79	(65.8)	41	(34.2)	1.75 (0.93-3.30)*	1.21 (0.57-2.53)
Family size						
Small family	89	(76.1)	28	(23.9)	1	1
Large family	55	(63.2)	32	(36.8)	1.85 (1.01-3.40)**	0.98 (0.42-2.27)
Mother chewing khat						
No	121	(73.3)	44	(26.7)	1	1
Yes	23	(59.0)	16	(41.0)	1.91(0.93-3.95)*	1.85 (0.79-4.31)
Place started chewing						
UK and elsewhere	36	(83.7)	7	(16.3)	1	1
Yemen	108	(67.1)	53	(32.9)	2.52 (1.05-6.05)**	1.51 (0.56-4.05)
Psychosocial intermediate explanatory variables						
Social participation						
High	76	(76.8)	23	(23.2)	1	1
Low	68	(64.8)	37	(35.2)	1.80 (0.97-3.33)*	1.55 (0.76-3.16)
Khat dependence						
Non-dependent	80	(80.0)	20	(20.0)	1	1
Dependent	64	(61.5)	40	(38.5)	2.50 (1.33-4.69)***	1.83 (0.82-4.09)
Behavioural proximal explanatory variables						
Composite khat behaviour						
Low	96	(73.8)	34	(26.2)	1	1
High	48	(64.9)	26	(35.1)	1.53 (0.83-2.84)	0.70 (0.31-1.59)
Tobacco smoking						
Non smoker respondents	51	(71.8)	20	(28.2)	1	1
Episodic smoker respondents	29	(69.0)	13	(31.0)	1.14 (0.50-2.63)	1.59 (0.58-4.29)
Regular smoker respondents	64	(70.3)	27	(29.7)	1.08 (0.54-2.14)	1.46 (0.65-3.27)
Dental attendance						
Regular/occasional check	60	(76.9)	18	(23.1)	1	1
In pain	54	(60.0)	36	(40.0)	2.22 (1.132-4.36) **	1.83 (0.86-3.91)
Never been to dentist	30	(83.3)	6	(16.7)	0.67 (0.24-1.85)	0.47 (0.14-1.55)

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

3. Self reported health conditions

The hierarchical logistic regression analysis between selected explanatory variables and self-reported health conditions was run in three stages.

Table 5 shows that at Stage I (a) age was adjusted for employment status, education level, crowding, marital status, family size, and mother chewing khat and living with other chewers. First, after adjusting age with employment status, education level, crowding variable, the effect of level of completed education was diluted and became insignificantly associated with self-reported health conditions (p=0.338). Age, employment and crowding remained significantly associated with self-reported health conditions. Adding the other variables related to the social dimension of khat chewers, namely, family size and marital status reduced the effect of age dramatically. The effect of age on self-reported health conditions when marital status was added was lessened. When family size was added at this stage age lost its significant association (p =0.069). Both family size and marital status were omitted from the model**.** Adding the variables of mother chewing khat and living with a chewer, though at this stage were not associated with self-report health conditions had weakened the effect of age, employment and crowding variables on self-reported health conditions. Older, unemployed and living in uncrowded housing respondents were more likely to self-report health conditions (Table 5, Stage I a)

In Stage I (b) variables related to acculturation such as period of residency, language preferred for reading and place of birth were added into the model. Period of residency, when added to the model, contributed poorly (Hosmer-Lemeshow Goodness of fit at 14.43 (df=8, p=0.071) and was omitted. Assessing

the effects of preferred language for reading and place of birth in the presence of other variables from Stage I (a), showed that both these acculturation related variables were not associated significantly with self-reported health conditions (p=0.758 and 0.677). Age, employment status and living in uncrowded housing remained statistically significantly associated with self-reported health conditions (Table 5, Stage I b).

Stage II reports the inclusion of the psychosocial variables. Social participation and khat dependence were entered into the model in the presence of other variables from Stage I (a & b). The effects of age, employment and living in uncrowded housing were weakened but still remained significantly associated with self-reported health conditions (Table 5, Stage II). Social participation became marginally associated with self-reported health conditions when entered into the model at this stage (Table 5 Stage II). Severity of dependence on khat (SDS-khat), in presence of other variables also lost it significant association with a self-reported health conditions at this stage (Table 5).

Finally, The composite of khat chewing behaviour was then entered into the model in Stage III in the presence of other variables from Stage I (a & b) and Stage II. Age, employment and living in uncrowded housing continued to be associated significantly with self-reported health conditions. The final model yielded from Stage III is presented in Chapter 4 Table 4.24, Page 166.

Further modelling was undertaken as follows:

- Adjusting the final (Chapter 4, Table 4.24) to include only tobacco smoking made little contribution to the model (Table not shown). Omitting the composite index of khat chewing from the final model (Chapter 4, Table 4.24), showed that respondents who were older, unemployed and living in uncrowded housing were more likely to self-report health conditions (Table not shown). Low social participation was marginally associated with self-reported health conditions (p=0.051). However, the addition of the composite index of khat chewing by itself into the model Chapter 4, Table 4.24 without the SDS-khat contributed poorly with a Hosmer-Lemeshow Goodness of fit at 15.39 (df=8, p=0.052) (Table not shown).
- Adding the composite index of khat behaviour into the final model (Chapter 4, Table 4.24) alongside the tobacco smoking behaviour, again omitting the SDS-khat showed that respondents who were older, unemployed and living in uncrowded housing were more likely to self-report health conditions. Low social participation was marginally associated with self-reported health conditions (p=0.057) (Table not shown).

Table 5: Relationships between self-reported health conditions and demographic, socio-cultural, psychosocial and behavioural explanatory variables in a hierarchical regression model (n=204)

Explanatory variables	No health conditions N (%)		With health conditions N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI) Stage I (a)	Adjusted OR (95%CI) Stage I (b)	Adjusted OR (95%CI) Stage I (a & b), II
Demographic and socio-cultural distal explanatory variables								
Age								
18-40 years	86	(83.5)	17	(16.5)	1	1	1	1
41 years and older	41	(40.6)	60	(59.4)	7.40 (3.84-14.25)***	3.21 (1.47-7.01)***	3.17 (1.37-7.27)***	3.16 (1.35-7.38)***
Employment status								
Employed	65	(90.3)	7	(9.7)	1	1	1	1
Unemployed	62	(47.0)	70	(53.0)	10.48 (4.48-24.56) **	4.99(1.90-13.10)***	5.16 (1.93-13.80)***	4.24 (1.57-11.46)***
Level of education								
High education	54	(77.1)	16	(22.9)	1	1	1	1
Low education	73	(54.5	61	(45.5)	2.82 (1.47-5.42)***	1.36 (0.61-3.03)	1.37 (0.59-3.17)	1.13 (0.48-2.67)
Crowding^								
Overcrowded	68	(81.9)	15	(18.1)	1	1	1	1
Uncrowded	58	(48.3)	62	(51.7)	4.84 (2.50-9.41)***	3.47 (1.64-7.36)***	3.47 (1.63-7.35)***	3.00 (1.39-6.43)***
Mother chewing khat								
No	108	(65.5)	57	(34.5)	1	1	1	1
Yes	19	(48.7)	20	(51.3)	1.94 (0.99-4.03)**	1.37 (0.58-3.26)	1.40 (0.59-3.35)	1.32 (0.53-3.30)
Living with chewer								
No	81	(69.2)	36	(30.8)	1	1	1	1
Yes	46	(52.9)	41	(47.1)	2.01 (1.13-3.57)**	1.40 (0.66-2.89)	1.40 (0.66-2.98)	1.44 (0.66-3.16)
Language of reading								
English, English & Arabic	65	(75.6)	21	(24.4)	1		1	1
Arabic and other	62	(52.5)	56	(47.5)	2.80 (1.52-5.15)***		0.88 (0.39-2.00)	0.84 (0.37-1.91)
City of birth								
Elsewhere	76	(69.7)	33	(30.3)	1		1	1
Yemen khat village	51	(53.7)	44	(46.3)	1.99 (1.11-3.53)**		1.17 (0.56-2.46)	1.25 (0.58-2.68)

Table 5: (Continued)

Psychosocial intermediate explanatory variables								
Social participation								
High	74	(74.7)	25	(25.3)	1			1
Low	53	(50.5)	52	(49.5)	2.90 (1.61-5.26)***			2.04 (0.97-4.20)*
Khat dependence								
Non-dependent	75	(76.0)	24	(24.0)	1			1
Dependent	51	(49.0)	53	(51.0)	3.29 (1.81-5.55)***			0.14 (0.83-3.71)
Behavioural proximal explanatory variables								
Composite khat behaviour								
Low	93	(71.5)	37	(28.5)	1			
High	34	(45.9)	40	(54.1)	2.96 (1.63-5.36)***			

***P≤ 0.1, **P≤0.05, ***P≤0.001, ^ One response missing**

4. Self-reported 'high' nicotine dependence

First, Table 6 reports among the distal demographic and socio-cultural variables that showed significant association with self-reported 'high' nicotine dependence in simple logistic regression analyses were place of starting tobacco smoking and marital status. In Stage I after adjusting for place of starting tobacco smoking with marital status, place of starting tobacco lost its significant association with self-reported 'high' nicotine dependence (OR= 2.04, 95%CI= 0.82-5.11). The association of marital status remained statistically significantly associated with self-reported 'high' nicotine dependence. Respondents in 'Other' marital status (widowed, single or divorced) were 2.64 (95%CI=1.04-6.71) times more likely to self-report 'high' nicotine dependence.

Second, in Stage II, the psychosocial variables, namely, social participation and SDS-khat effects on the likelihood of respondents to self-report 'high' nicotine dependence were added into the model alongside Stage I variables. The place of starting tobacco smoking regained its significant association with self-reported 'high' nicotine dependence (OR= 3.40, 95%CI= 1.14-10.08). The effect of being in "Other' marital status on the likelihood of respondents self-reported 'high' nicotine dependence increased (OR=3.03, 95%CI=1.10-8.39). The effects of all the psychosocial variables that showed a significant association with self-reported 'high' nicotine dependence in simple logistic regression remained statistically significantly. The effects of social participation increased greatly, 2.65 (95%CI=1.12-6.25) to 4.92 (95%CI=1.68-14.41), and that of the SDS slightly 3.00 (95%CI=1.27-7.08) to 3.58 (95%CI=1.35-9.48).

Finally, in Stage III, the composite index of khat chewing behaviour and number of cigarettes smoked during chewing were added alongside variables from Stages I

& II. At this Stage the SDS-khat became insignificantly (p= 0.156) associated with self-reported ‘high’ nicotine dependence and a slight decrease in the effect of both social participation and marital status on self-reported ‘high’ nicotine dependence was observed. The composite index of khat chewing behaviour was no longer associated with self-reported ‘high’ nicotine dependence at this stage (OR=2.72, 95%CI=0.81-9.13). The number of cigarettes smoked during khat chewing was marginally associated with self-reported ‘high’ nicotine dependence (p= 0.078, OR= 3.12, 95%CI= 0.88-11.10).

Including the variable ‘continuing smoking after spitting khat’, though significantly associated with self-reported ‘high’ nicotine dependence in simple logistic regression contributed poorly. Hosmer-Lemeshow Goodness of fit was at 16.78 (df=8, p=0.032). Therefore, this variable was excluded from the model. The results of this final model emerged from Stage III are presented in Chapter 4, Table 4. 29, Page 172.

The results of the alternative models showed that:

Omitting the SDS from the model and retaining first the composite index of khat behaviour showed that respondents who started smoking in the UK and elsewhere than Yemen, being in other marital status, with low social participation and high composite khat behaviour were more likely to self-report ‘high’ nicotine dependence (OR=3.10,95%CI=1.03-9.28; OR=3.45, 95%CI=1.22-9.71; OR=3.05, 95%CI=1.03-9.02; OR=4.27,95%CI=1.50-12.14) (Table 7).

Adding to this model the number of cigarettes smoked during chewing was found to be associated with self-reported ‘high’ nicotine dependence. Respondents who

started smoking in the UK and elsewhere than the Yemen, being in other marital status, with low social participation, with high composite index of khat behaviour and smoking more than 10 cigarettes during a chewing session were more likely to self-report ‘high’ nicotine dependence (OR=3.20,95%CI=1.04-9.85; OR=3.27, 95%CI=1.11-9.64; OR=3.37, 95%CI=1.11-10.19; OR=3.47, 95%CI=1.19-10.16; OR=3.61, 95% CI = 1.05-12.31) (Table 7).

Omitting the composite index of khat behaviour and retaining the SDS-khat showed that respondents who started smoking in the UK and elsewhere as opposed to Yemen, being in other marital status, with low social participation and being dependent on khat were more likely to self-report ‘high’ nicotine dependence (OR=3.39,95%CI=1.14-10.08;OR=3.03,95%CI=1.10-3.38;OR=4.92,95%CI=1.68-14.41;OR=3.58,95%CI=1.35-9.48). Adding to this model the number of cigarettes smoked during a chewing session contributed poorly (Table 8).

Table 6: Relationships between self-reported 'high' nicotine dependence and demographic, socio-cultural, psychosocial and behavioural selected explanatory variables in a hierarchical regression model, in a sample of UK resident adult male Yemeni khat chewers (n=91)

Explanatory Variables	Low N (%)		High N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI) Stage I	Adjusted OR (95%CI) Stage II
Demographic and socio-cultural distal explanatory variables							
Place started tobacco							
Yemen	38	(63.3	22	(36.7)	1	1	1
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)*	2.04 (0.82-5.11)	3.40 (1.14-10.08)**
Marital status							
Married	40	(64.5)	22	(35.5)	1	1	1
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41) **	2.64 (1.04-6.71)*	3.03 (1.10-8.39) **
Psychosocial intermediate explanatory variables							
Social participation							
High	30	(68.2)	14	(31.8)	1		1
Low	21	(44.7)	26	(55.3)	2.65 (1.12-6.25)**		4.92 (1.68-14.41)***
Khat dependence							
Non-dependent	34	(68.0)	16	(32.0)	1		1
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)**		3.58 (1.35-9.48)**
Behavioural proximal explanatory variables							
Composite of khat behaviour							
Low	41	(68.3)	19	(31.7)	1		
High	10	(32.3)	21	(67.7)	4.53(1.79-11.47)***		
Cigarettes smoked during chewing							
Up to 10 cigarettes	19	(79.2)	5	(20.8)	1		
11 cigarettes and more	32	(47.8)	35	(52.2)	4.16(1.39-12.43)***		

***P≤ 0.1, **P≤0.05, ***P≤0.001**

Table 7: Further regression modelling of self reported 'high' nicotine dependence and khat chewing and tobacco smoking behaviours only (n=91)

Explanatory Variables	Low N (%)		High N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Place started tobacco						
Yemen	38	(63.3	22	(36.7)	1	1
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)*	3.20 (1.043-9.85)**
Marital status						
Married	40	(64.5)	22	(35.5)	1	1
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41) **	3.27 (1.11- 9.64)**
Psychosocial intermediate explanatory variables						
Social participation						
High	30	(68.2)	14	(31.8)	1	1
Low	21	(44.7)	26	(55.3)	2.65 (1.12-6.25)**	3.37 (1.11-10.19)**
Khat dependence						
Non-dependent	34	(68.0)	16	(32.0)	1	
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)**	
Behavioural proximal explanatory variables						
Composite of khat behaviour						
Low	41	(68.3)	19	(31.7)	1	1
High	10	(32.3)	21	(67.7)	4.53(1.79-11.47)***	3.47 (1.19-10.16)**
Cigarettes smoked during chewing						
Up to 10 cigarettes	19	(79.2)	5	(20.8)	1	1
11 cigarettes and more	32	(47.8)	35	(52.2)	4.16(1.39-12.43)***	3.61 (1.05-12.31)**

***P≤ 0.1, **P≤0.05, ***P≤0.001**

Table 8: Further regression modelling of self reported 'high 'nicotine dependence and khat dependence variable only (n=91)

Explanatory Variables	Low N (%)		High N (%)		Unadjusted OR (95%CI)	Adjusted OR (95%CI)
Demographic and socio-cultural distal explanatory variables						
Place started tobacco						
Yemen	38	(63.3	22	(36.7)	1	1
UK and elsewhere	13	(41.9)	18	(58.1)	2.39 (0.99-5.80)*	3.40 (1.14-10.08)**
Marital status						
Married	40	(64.5)	22	(35.5)	1	1
Other marital status	11	(37.9)	18	(62.1)	2.98 (1.19-7.41) **	3.03 (1.10-8.39) **
Psychosocial intermediate explanatory variables						
Social participation						
High	30	(68.2)	14	(31.8)	1	1
Low	21	(44.7)	26	(55.3)	2.65 (1.12-6.25)**	4.92 (1.68-14.41)***
Khat dependence						
Non-dependent	34	(68.0)	16	(32.0)	1	1
Dependent	17	(41.5)	24	(58.5)	3.00 (1.27-7.08)**	3.58 (1.35-9.48)**

***P≤ 0.1, **P≤0.05, ***P≤0.001**

Appendix 11: Yemen map

http://www.mapsofworld.com/yemen/maps/yemen-map.jpg
(Accessed on: 4/12/2009)

Appendix 12: Publication

Khat chewing amongst UK resident male Yemeni adults: an exploratory study

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Aim: This cross sectional study recruited adult male Yemeni residents in Sheffield and Birmingham, UK, to assess their use of khat. **Methods:** Structured interviews were conducted in both areas during weekly khat chewing sessions. The data collected included socio-demographic characteristics, khat use, dependency on khat, psychological functioning of chewers (GHQ-12) and nicotine dependency. Patterns of khat use, dependency and psychological functioning were correlated with age and self-reported oral problems. **Results:** 75 khat chewing volunteers (mean age 40.75 years) were interviewed. Average age of starting khat chewing was 17 years. The weekly amount chewed ranged from 0.25-3.0 khat bundles. Older respondents were more likely to be frequent chewers ($p<0.025$). 39% were assessed as dependent on khat, which correlated with frequency of use ($p<0.041$) and being in debt ($p<0.046$). Khat chewing correlated with nicotine dependence ($p< 0.014$). Self-reported oral problems correlated with both nicotine ($p<0.04$) and khat dependence ($p<0.001$). 93% reported that khat chewing promoted excessive smoking and 12% that this practice had initiated their tobacco use. **Conclusions**: Khat chewing creates dependency and correlates with tobacco smoking and nicotine dependence. Further research should investigate the correlations between khat and nicotine dependence. Development of a specific measure of khat dependence is recommended.

Key words: Khat, cigarette smoking, oral health, dependency

Khat (Catha edulis) is cultivated throughout East and South Africa, Yemen, and Madagascar[1,2]. Khat chewing, which releases cathinone, a natural amphetamine[3] was until recently a habit only common in areas where it was grown because it rapidly loses its freshness. However the development of air transport has contributed to the widespread practice of khat chewing elsewhere[4], although it is currently banned in Sweden, USA and Saudi Arabia[1,5]. Debates have focused on the need for its international control, because it is reported to create socio-economic and health problems for the communities using it without any useful therapeutic outcomes[6]. In the UK, khat from Kenya, Ethiopia and Yemen is transported to London and distributed to areas with Yemeni, Somalian and Ethiopian communities such as Sheffield, Liverpool, Cardiff and Bristol. Water and soft drinks consumption accompany khat chewing, along with cigarette smoking. The literature has reported the potential adverse effects of khat use on oral health[7-9], mental health[10,11], and the gastrointestinal tract[12,13]. As population-based studies of khat chewing amongst UK resident Yemenis are few, this study aimed to investigate if further.

Materials and methods

A cross-sectional study design was adopted. The questions were developed from those used in a study carried out amongst Somali khat chewers in East London[14]. It consisted of six sections with open and closed end questions. Data were collected on: the demographic characteristics of the participants, khat use and self-reported oral health problems that might be linked with khat chewing. Dependence on khat was measured by using the severity of dependence scale (SDS)[15], psychological functioning of khat chewers was explored by using the General Health Questionnaire (GHQ-12)[16] and tobacco use and nicotine dependence was investigated by using the Fagerstrom Test for Nicotine Dependence (FTND)[17].

0020-6539/06/02097-05

A pilot survey took place among six Yemeni khat chewers in East London. Birmingham and Sheffield were chosen as localities for the main study on the basis of the larger numbers of Yemenis resident there. Khat chewers living there were informed about this study through the heads of their community. Only male adult (aged 18 years and over) Yemeni khat chewers permanently resident in the UK were included in this study.

The interviews took place on Saturday and Thursday afternoons in the community settings where khat was chewed. Potential volunteer participants were informed about the study's purpose and were reassured about the confidentiality of their responses before being invited to take part. Collection of the data took twelve weeks from February-April 2004.

The data were analysed using SPSS. The Chi Square test was used to explore associations between the variables under investigation. The level of significance adopted was $p<0.05$. GHQ-12 scores range from 0-12 and the threshold for psychiatric disorder is eight. The SDS scores range from 0-15 and the dependency threshold adapted for this study was responding positively to five items. Scores for FTND range from 0-14. Scores of six and above were considered as indicating high nicotine dependency.

Results

Seventy-five volunteers were interviewed, thirty-eight from Sheffield and thirty-seven from Birmingham. Their average age was 40.8 years (range 20-84 years), 84% were born in Yemen and 95% had completed at least primary education in Yemen, 56% of participants were employed and 87% married.

Of the sample, 83% had originally started khat chewing in Yemen, at an average age of 17 years. Chewers reported being introduced to the habit either by friends or a family member. The number of khat bundles chewed in a session ranged from 0.25 to 3.00. Employed respondents opted to chew one day per week, usually on Saturday, whilst 73% of the 33 unemployed chewers reported chewing khat on more than two days. The number of hours spent chewing khat was reported to range from 3-36 hours per week. For nearly all respondents (93%) khat chewing was a social rather than a solitary activity. Twenty seven per cent of respondents reported a belief that khat chewing was good for their community, as it contributed to the community's social cohesion and protected its members from other pursuits inappropriate for Moslems.

The average price paid for a bundle of khat was reported as £5 sterling and 25% of chewers reported being in debt to khat sellers. Thirty nine per cent of the respondents were assessed as dependent on khat, and whilst 56% identified themselves as regular smokers, nearly all respondents (95%) reported smoking during a khat session. Nearly all (92%) were also of the opinion that khat chewing promoted excessive smoking. Twenty nine per cent of respondents were identified as having either high or very high nicotine dependence and 55% reported having oral problems. Two thirds of respondents reported receiving no formal education related to khat and its effects.

Table 1 reports the association between respondents' age and the pattern of khat use. It shows that younger respondents started khat chewing at an older age compared to the older respondents. Younger respondents were significantly more likely to chew only one day per week and to chew more khat per session compared with the older respondents. The younger respondents were also more likely to report not having changed their pattern of consumption compared to 12 months previous. *Table 2* reports aspects of khat chewing and its association with self-reported oral problems. Respondents with self-reported oral problems were significantly more likely to have been resident in the UK for 16 years or less, to be identified as dependent on khat and to also report high or very high levels of nicotine dependency. *Table 3* reports the associations between respondents assessed as dependent on khat and the association of this with their khat chewing. Respondents introduced to khat by their families, chewing on more than two days per week, chewing more than 12 hours per week, not washing khat before chewing, in debt to the khat seller and assessed as nicotine dependent were significantly more likely to be assessed as dependent on khat.

Discussion

This is the first report of khat dependence amongst UK resident Yemeni khat chewers. Within a cross-sectional study design, network sampling[18] was adopted. This assumes that questions of interest in communities for which there is no sampling frame can be addressed through samples selected by non-probability methods. The adoption of a structured data collection instrument enabled greater control over the quality of the data collection process.

This study has confirmed the findings of previous studies in that khat dependence was associated with those introduced to the habit by their families suggesting that some of this sample were from rural Yemen[19,20]. Indeed 48% of the chewers in this survey were born in Yemeni villages. Infrequent khat use has also been associated with higher levels of education and employment status[1]. Employed chewers in this study were more likely to report episodic khat consumption whilst unemployed users chewed more frequently. Khat chewing is expensive, usually associated with smoking and soft drinks intake[21] and in this sample £5 sterling was the average price the chewers paid for a bundle. Not surprisingly, the high levels of unemployment correlated with high levels of indebtedness to sellers.

Solitary khat consumption is rare[22] and chewing for

Table 1 Association between age and khat pattern use variables

	20-39 years (%) (n=43)	40 years and above (%) (n=32)	*P value*
Age of starting chewing			
Up to 17 years	48.8	75.0	0.022
From 18 years to highest	51.2	25.0	
First gave chewer the khat			
Close friend or bought himself	58.1	56.2	0.870
One of the family members	41.9	43.8	
Years of chewing khat			
Up to 24 years	90.7	18.8	0.000
From 25 years to highest	9.3	81.2	
Years of residency			
Up to 16 years	90.7	37.5	0.000
17 years and more	9. 3	62.5	
Number of days of chewing per week			
One day per week	60.5	34.4	0.025
More than two days	39.5	65.6	
Time consumed in chewing			
Up to 12 h per week	67.4	71.9	0.680
From 13 h to highest	32.6	28.1	
Drinks consumption			
Alcohol, tea, coffee and water	25.6	43.8	0.089
Soft drinks	74.4	56.3	
No. of khat bundles chewed per session			
Up to 1 bundle	48.8	71.9	0.045
From 1.5 to highest	51.2	28.1	
Compare current khat use with last year			
I am using more/much khat	14.0	40.6	0.009
I am using the same or a little/ much less	86.0	59.4	

Table 2 Association between khat use and oral problems

	Chewers with oral problems (%) (n=41)	Chewers without oral problems (%) (n=34)	*P value*
Bundles of khat used per session			
Up to 1 bundle	56.1	61.8	0.620
From 1.5 bundle to highest	43.9	38.2	
Time consumed in chewing			
Up to 12 hours	63.4	76.5	0.222
From 13 hours to highest	36.6	23.5	
Years of chewing khat			
Up to 24 years	65.9	52.9	0.256
From 25 years to highest	34.1	47.1	
Years of residency in UK			
Up to 16 years	80.5	52.9	0.011
From17 years to highest	19.5	47.1	
Drinks associated with khat			
Soft drinks	31.7	35.3	0.743
Other	68.3	64.7	
Severity of dependency on khat			
No dependency	43.9	82.4	0.001
Dependency	56.1	17.6	
Nicotine dependency			
Very low, low and medium dependency	57.1	85.7	0.040
High and very high dependency	42.9	14.3	

Table 3 Association between severity of dependency on khat and khat use

	No dependency (%) (n=46)	Dependency (%) (n=29)	*P value*
First introduced khat to chewer			
Friend	67.4	41.4	0.027
Family	32.6	58.6	
Number of days chewing per week			
One day per week	58.7	34.5	0.041
More than two days	41.3	65.5	
Time consumed in chewing			
Up to 12 hours	78.3	55.2	0.035
From 13 hours to highest	21.7	44.8	
Years of residency in UK			
Up to 16 years	67.4	31	0.887
From17 years to highest	32.6	69	
Washing khat			
Yes	43.5	17.2	0.019
No	56.5	82.8	
Debt to khat seller			
Yes	17.4	37.9	0.046
No	82.6	62.1	
Nicotine dependence			
Very low, low and medium Nicotine Dependency	66.7	25	0.014
High and very high Nicotine Dependency	33.3	75	

nearly all (93%) in this study was reported to mainly facilitate social interaction. Muslims have reported the use of khat as an alternative to the use of alcohol[2,23,24], although informal reports from this sample suggested that they would be more liable to shift to drinking alcohol, which was forbidden for them as Muslims, if the legal position of khat was changed.

Whether khat chewing creates dependency[25-27] and psychological problems[22,28,29] is unresolved. Only a very small percentage (6%) of khat chewers in this study were psychologically dysfunctional according to their GHQ-12 scores. The use of the Severity of Dependence Scale suggested, however, that 39% of this sample were dependent on khat. Excessive cigarette consumption during khat chewing sessions has also been reported in the literature[7,14,30]. The smoking prevalence reported by the sample respondents was more than twice that current in the general UK adult population[31]. The findings from this study showed that 29% of chewers had high nicotine dependence according to the Fagerstrom Test for Nicotine Dependency (FTND) and khat chewing may act as a gateway to nicotine dependence. Some respondents reported smoking only when they chewed khat whilst many others indicated that khat chewing promoted increased smoking. Although this latter finding has been previously reported[7,14,30], these studies did not clarify whether previously validated measures of dependence on khat and nicotine had been adopted. Chewers were unaware of the seriousness of smoking which is usually associated with khat. This is hardly surprising given that 64% of respondents reported not to have received any formal education about khat chewing and its effects. The findings suggest that the relationship between khat chewing and smoking should be explored further, so that an appropriate educational content can be developed.

Tobacco use and consumption of soft drinks are both well documented as potential risk factors for oral conditions[31,32]. In this study, in addition to the high prevalence of smoking, soft drink use was high with a trend for the younger age group to use them more. Self-reported oral problems were linked significantly with both khat and nicotine dependency.

Conclusions

In this sample, khat chewing led to dependency and was found to correlate with smoking, nicotine dependence and oral problems. Further research should validate the findings from this study, especially the relationship between khat chewing and nicotine dependence. The development of a specific measure of khat dependency is recommended. Women khat chewers were not included in this study and their needs await investigation.

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